OBESITY, PHYSICAL ACTIVITY AND BODY IMAGE IN TAIWANESE ADOLESCENTS

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ABSTRACT

There is a paucity of research investigating the factors among body image, obesity and physical activity and how obesity and physical activity might affect body image among Taiwanese adolescents. Examining these issues could provide a greater understanding and additional opportunities for more proactive in facilitation of healthy behaviours, which may lead to improved psychological development. Encouraging physical activity may also reduce the risk of obesity, promote positive body image and healthy lifestyle for adolescents.

The aims of this research were to understand the current prevalence of obesity, physical activity patterns and body image concerns among Taiwanese adolescents, explore the behaviours they adopt to strengthen their body image, and examine the influences of obesity and physical activity on their body image. A series of four studies were conducted adopting both quantitative and qualitative approaches.

Study 1 and study 2 used quantitative approaches with secondary data sets to evaluate the prevalence of obesity and physical activity among Taiwanese adolescents. Both studies were cross-sectional and had nationally representative samples. In the third study, a self-report questionnaire was completed by 883 adolescents, examining the prevalence of body dissatisfaction and factors associated with body dissatisfaction. Following this, qualitative interviews (study 4) were conducted to explore body image concerns in relation to obesity and physical activity in overweight/obese adolescent girls.

The results showed an increasing trend in overweight/obesity prevalence for Taiwanese adolescents, and a clear gender difference with boys being more overweight and obese. Increasing activity is associated with better health; however, the percentage of Taiwanese adolescents meeting recommended amounts of physical activity for health is low with girls in the 15-18-age range being the least active group. A high proportion of adolescents reported body dissatisfaction. There was a gender-specific cultural pressure on ideal body shape with girls wishing to be thinner and boys wishing to be thinner or bigger. Body weight category was strongly associated with body dissatisfaction with overweight/obese adolescents reporting higher body dissatisfaction.

In sum, three quantitative studies with large samples offer more reliable data for understanding the current prevalence of and associations between obesity, physical activity and body dissatisfaction in Taiwanese adolescents. The findings provide a baseline for future comparisons and preliminary identification of subgroups at higher risk of obesity, physical inactivity, and body dissatisfaction among Taiwanese adolescents. The qualitative study offered a map of the body image concerns and motivations/barriers of physical activity participation in Taiwanese overweight/obese adolescent girls. The in-depth information gained from the interviews provides insight for physical activity promotion and intervention programmes among overweight/obese girls in Taiwan.

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I declare that the work in this dissertation was carried out in accordance with the Regulations of the University of Bristol. The work is original, except where indicated by special reference in the text, and no part of the dissertation has been submitted for any other academic award. Any views expressed in the dissertation are those of the author.

Signed: Lijung Chen

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1 Introduction

The pandemic of obesity

Research has demonstrated a growing increase in the prevalence of overweight and obesity among children and adolescents. Over the past 30 years, the prevalence of overweight and obesity in young Americans has more than doubled (Troiano & Flegal, 1998). This trend is not restricted to westernised societies. In China, between 1982 and 1992, the prevalence of overweight and obesity in adolescents increased from 9.7% to 14.9% in urban areas (International Obesity Task Force, 2000). In Korea, a longitudinal study showed that 15.7% of children aged 7-8 were classified as overweight in 1997; six years later, the overweight prevalence increased to 26.2% (Lee et al., 2004).

This phenomenon of increasing obesity is also evident in Taiwan (Chu, 2005; Taiwan National Institute for the Health Research, 2001). The Taiwan National Institute for Health Research (2001) revealed that the prevalence of childhood and adolescent obesity has dramatically risen during recent years. For adolescent girls, the reported prevalence of obesity ranges between 11.4% and 16.4% in some areas. It has become urgent that the authorities develop strategies for the prevention of adolescent obesity, as it tracks at a high rate into adulthood, leading to elevated risk of several chronic diseases (Must et al., 1992; Vanhala et al., 1998). This poses a tremendous public health problem, lowering the quality of life of obese individuals and imposing a heavy financial burden on health care systems (International Obesity Task Force, 2000; Ricciardelli et al., 2003; Taiwan National Institute for the Health Research, 2001).

The World Health Organization (WHO) (2000) and other research examining obesity and health risk have suggested defining obesity at lower body mass index (BMI) in Asian populations, since these populations tend to accumulate intra-abdominal fat without developing generalised obesity (International Obesity Task Force, 2000). A growing body of evidence suggests that Asian people may underestimate the

prevalence of obesity and the obese situation is likely to get worse in Asian countries (World Health Organization, 2003b).

The identity and development challenges of adolescence

Adolescence is a complex stage of development, a time when physical, psychological, and cognitive growth produce tensions, contradictions and often substantial pressure. During this period, physical development is in flux and imbalance (Chang, 1994). Physical development towards the adult female shape that features wider hips and increased body fat (a 'fat spurt'), and physical changes associated with puberty, can predispose adolescent girls to experience over-sensitivity and over-concern regarding body shape (Field, 2002).

The growing and developing youth often face this dramatic physiological revolution within themselves at a time when they are attempting to establish an independent and mature identity (Erikson, 1963). Physical appearance is particularly critical at this stage of development, where acceptance of personal appearance and construction of a healthy body image are considered important developmental tasks (Havighurst, 1972). Following puberty, girls' experience of physical body changes and increased body fat (Kaneko et al., 1999; Shadley, 2002), potentially may limit the personal acceptance of appearance and shape and consequently impacting on healthy body image and overall development of self-identity. Physical appearance and in particular, issues around slenderness, fatness, abnormal height and shape are particularly influential in the way adolescents see themselves. The body acts as the interface for social interactions, which are also critical for adolescents; therefore it is not surprising that body-related perceptions influence psychological outcomes and health-related behaviours (Eisenberg et al., 2006; Neumark-Sztainer et al., 2006; Neumark-Sztainer et al., 2006; Page et al., 2005).

The influence of Western values

The issue of body image and perceptions of fatness/slenderness has become increasingly central to western culture and values, and plays greater prominence in the adolescent sub-culture. Many children and adolescents, particularly girls, report dissatisfaction with their body, display concerns about becoming overweight, and engage in weight loss behaviours such as eating less and exercising to lose weight (Ricciardelli & McCabe, 2001a; Ricciardelli et al., 2003). Research revealed that by the age of nine, the desire for thinness and associated dieting motivation was apparent in some children (Hill et al., 1994). Sands et al. (1997) described that the trend for desiring to be thinner in girls, may be the result of a number of interrelated factors, such as self-efficacy, developmental integrity, actual height and weight, peer group preferences, media and other lifestyle influences. Children and adolescents are exposed to messages about physical appearance from a young age and these influence the way they feel about their body (Emma & Jane, 2003). They learn more rapidly through simple observation of others' behaviours in social situations (Bandura, 1977). The messages from media, parents, and peers lead to both social comparison about appearance and internalisation of the thin ideal (Schwartz et al., 1999). Thus, adolescent girls exist in a culture that bombards them with messages and images of the 'body ideal'. Internalisation of the thin-ideal and tendency toward social comparison prominent in adolescence become the standards by which the individual defines herself and others. These standards of thinness and beauty may influence an adolescent's perception of her body (Durkin & Paxton, 2002; Pesa et al., 2000).

Therefore, cultural standards for physical attractiveness that promote the importance of body weight may predispose girls to the development of high body standards that are often unreachable and may, in turn, lead to the development of maladaptive eating and exercise patterns (Cash, 1990; Rice, 1995). Anton et al. (2000) found that the ideals individuals hold for themselves in terms of body weight and size not only impact their body satisfaction, but also their eating and exercise behaviours. The discrepancies between ideal and actual body sizes play a key role in the development of unhealthy eating and exercise behaviours.

Body image, eating patterns and physical activity (exercise)

Stemming from these discrepancies and the drive toward physical self-acceptance, body image dissatisfaction is one of the strongest predictors and primary factors in placing adolescent girls and women at risk of unhealthy behaviours, such as poor nutritional and physical activity habits (Nowak, 1998). Individuals with high body dissatisfaction may engage in physical activity in an attempt to control their weight and reduce their body image disturbance (Hausenblas & Fallon, 2002). These methods (such as dieting and physical activity behaviours) adopted to change body shape and size among young girls have been linked to the prevalence of images of thinness influenced by socio-cultural factors (Harrison & Cantor, 1987; Ricciardelli et al., 2000). As adolescence is a period marked by pronounced physical, psychological, emotional, and social changes, the dramatic physical changes have been implicated in triggering body image problems (Pesa et al., 2000). Besides this, psychological problems can develop in overweight and obese adolescent girls, as their weight is perceived as a significant handicap (International Obesity Task Force, 2000).

By understanding how young people construct their body image during adolescence and the relationship of this to actual weight status and physical activity behaviours may provide the potential for prevention and intervention. Promoting behavioural changes in terms of physical activity are also important in the prevention of obesity (International Obesity Task Force, 2000). Identifying negative body image might play the largest role in alerting educators, parents, and health professionals to the need for enhancing and employing strategies to battle the bombardment of socio-cultural messages aimed at adolescents (Pesa et al., 2000) and improving the poor body image and dissatisfaction frequently found in adolescents. This is especially true for adolescent girls who are less active, more likely to undertake unhealthy dietary practices and more likely to smoke to manage weight than boys in Western countries (Fulkerson & French, 2003; Lowry et al., 2002; Neumark-Sztainer et al., 2006).

Research aims and objectives

In Taiwan, there is a paucity of research investigating the factors among body image, obesity and physical activity and how obesity and physical activity might affect their health and body image. Research suggests that girls may engage in diet and physical activity in an attempt to control their weight and reduce body image disturbance (Fox et al., 1994; Page & Fox, 1997). However, exercise and sport settings might present additional pressures on participants (Krane et al., 2003). Obese girls might suffer anxiety when attempting to exercise in public places due to perceived scrutiny by others and thus be less likely to continue exercise (Bezner et al., 1997). Moreover, in Western countries, adolescent girls with the 'fat spurt' may exercise to reduce body fat and increase muscle tone, while in Chinese culture, girls desire to develop thinness and might want to avoid becoming too muscular. They might engage in less exercise or avoid exercise, which may lead to increase risks for developing potentially serious health problems such as eating disorders in order to lose weight. Therefore, how to develop positive body image and encourage healthy physical activity habits during the early adolescent period are important for 1) the avoidance of poor mental health, 2) the avoidance of developing of disordered eating, 3) avoidance and therapy for obesity. These issues are central to both public health and education policy.

The aims of this research are to understand body image concerns among Taiwanese adolescents, explore the behaviours they adopt to strengthen their body image, and analyse the influences of obesity and physical activity on their body image. Answers to these questions could potentially provide an understanding leading to opportunities for more proactive in facilitation of healthy behaviours, which may lead to improve psychological development. Encouraging physical activity may also reduce the risk of obesity, promote positive body image and healthy lifestyle for adolescents.

The research objectives are therefore to 1) examine the prevalence of childhood and adolescent obesity in Taiwan and investigate the association between obesity, fitness and health; 2) understand the physical activity and weight control behaviours in Taiwanese adolescents; 3) assess body dissatisfaction and examine the relevant factors associated with body dissatisfaction in Taiwanese adolescents; 4) explore the

attitudes toward obesity, physical activity and body image in Taiwanese adolescents and capture their ideal body image and the degree to which they are influenced by these ideals.

Research structure

For these objectives to be achieved, the remainder of this research is organised in the following way:

The first section (Chapter 2) is a review of the literature, addressing concepts of body image, consequences of obesity, and influences of physical activity. Then, the relationships between obesity, physical activity and body image are briefly discussed. After which the research method is presented (Chapter 3) with full details of the research design. This is followed by study 1 (Chapter 4), study 2 (Chapter 5), study 3 (Chapter 6), and study 4 (Chapter 7), with a thorough description of the background information for the participants, procedures, and measures. Results for the various analyses are presented and discussions and conclusions are drawn. The final section (Chapter 8) presents a general discussion including a summary of the findings within each study and a synthesis of the findings across the four studies. Suggestions are made for further research and implications for future policy and practice are addressed.

CHAPTER 2 Literature Review

2.1 Concepts of body image

2.1.1 Meaning of body image

In the first decade of the last century, research on body image was limited to the studies of distorted body perceptions caused by brain damage. Schilder's work in the 1920s broadened the field as he developed the wider psychological and sociological frame works within which perceptions and experiences of body image took place (Grogan, 1999; Loland, 1999; Schilder, 1950). Schilder (1950) illustrated that body image developed in interaction with the biological changes and the interpretations of the changes by the individuals and socio-cultural context. He stated body image as 'the picture of our own body which we form in our mind, that is to say the way in which the body appears to ourselves' (p 11). Bruch (1980) further elaborated that this is a concept built from all sensory and psychic experiences.

Fisher and Cleveland (1958) defined body image as a term which referred to the body as a psychological experience, and focused on the individual's subjective experiences with his body and the manner in which he organised these experiences. They viewed body image as the internal subjective representation of physical appearance and bodily experience. Rice (1996) described that body image was an individual's experiences of her body. It was the mental picture a person had of his/her body as well as individual's associated thoughts, feelings, judgments, sensations, awareness and behaviours. It developed through interactions with people and the social world, changing across the life span in response to changing feedback from the environment.

Thus, body image is thought to be a subjective, comprehensive, and evaluated concept that individuals view about their bodies and which they perceive how the external world views them (Jhang, 1995). This reflects the notion that others' opinions of us (or our perceptions of how others view us) have significant influence on how we see ourselves. In addition, perceptions of others' evaluations have a significant impact on self-evaluations and receiving feedback on physical appearance

is often the means by which people develop perceptions of how others view them (Tantleff-Dunn & Gokee, 2002).

Another scholar, Thompson (1990) focused on the physical appearance-related aspects of body image. The essential feature of the physical appearance definition of body image is an evaluation of one's size, weight, or any other aspects of the body that determined physical appearance. He indicated that generally, researchers and clinicians subdivided the physical appearance construct into three areas: a perceptual component, commonly referred to as size perception accuracy (estimation of body size); a subjective component, which dealt with facets such as satisfaction, concern, cognitive evaluation, and anxiety; and a behavioural component, which focused on avoidance of situations that caused the individual to experience physical appearance-related discomfort.

Present researchers increasingly agree that body image is a complex and multifaceted construct consisting of perceptions, thoughts, and feelings (Cash & Pruzinsky, 2002; Davis & Katzman, 1999; Grogan, 1999; Kearney-Cooke, 2002; Loland, 1999; Pesa et al., 2000; Thompson, 1990). Body image perceptions relate to the accurate estimate of one's body size. Thoughts and feelings are attitudes toward one's body. Thoughts refer to a person's subjective evaluation of body satisfaction or dissatisfaction. Feelings refer to the emotional experiences that occur in responses to body shape and size.

To sum up, individuals' body images are composed not only of their physical characteristics, but also of their personal experiences and evaluation of their bodies. Therefore, body image is a subjective, multifaceted and emotionally charged development process, which translates the physical body into a mental representation and then into attitudes and behaviours toward the body (Kearney-Cooke, 2002).

2.1.2 Prevalence of body image concerns

Body image is a very important aspect of psychological and interpersonal development during adolescence, particularly for girls (Levine & Smolak, 2002). Rice (1996) pointed out that physical appearance was a central concern for many adolescent girls. A report revealed that 85% of adolescent girls aged 11-19 worried 'a lot' about the way they looked (Canada Teachers' Federation, 1990). From reviewed articles on physical attractiveness, Jackson (2002) found that attractive people were perceived as having greater occupational or academic competence, and more social appeal. They experienced more positive interaction, received more attention and increased dating opportunities. Davis (1997a) also reported that many studies had found a positive relationship between happiness and physical attractiveness.

However, a large number of individuals between the ages of 6 and 17 were unhappy with their weight (Thompson & Smolak, 2002) and a higher proportion of girls responded that they were dissatisfied with their body shape (Australia Institute of Health and Welfare, 2003; Kim & Kim, 2003). Research has shown that dissatisfaction with one's physical appearance is associated with incidence of depression, heightened anxiety, lowered self-esteem, growing demands for plastic surgery, and increased spending for items to guarantee weight loss (Mautner et al., 2000). In addition, a growing trend exists among adolescent girls to become more involved in extreme dieting behaviours and extensive exercise, which is often due to the body image concerns (Rhea, 2004; Sundgot-Borgen, 1994).

Prevalence of body dissatisfaction

Research on adolescents' body image has been conducted in many studies (Caradas et al., 2001; Fung & Yuen, 2003; Kaneko et al., 1999; Kim et al., 2003; Lau et al., 2003; Levine et al., 2002; McCabe & Ricciardelli, 2001; McCabe et al., 2002; The McCreary Centre Society, 2003). Levine and Smolak (2002) estimated that approximately 40-70% of adolescent girls were dissatisfied with two or more features of their bodies and between 50% and 80% of adolescent girls would like to be thinner in some developed countries. In the 2003 British Columbia Adolescent Health Survey, including over 30,000 students in grades 7 through 12, the findings showed that many

girls who were a healthy weight thought they were overweight, and about half were trying to lose weight (The McCreary Centre Society, 2003). Among urban Native American youth (aged 5 to 18 years), 61% of the girls expressed a desire to be thinner (Rinderknecht & Smith, 2002).

Fung and Yuen (2003) investigated the relation between body image and eating attitudes among a sample of 358 adolescent girls in Hong Kong. The results showed that even though only 4.8% of the girls were overweight, 85.2% desired to weigh less. Preceding Taiwanese studies also indicated that 65.5% of girls aged 11-14 wanted to be thinner (Wong et al., 2000) and only a small proportion of high school students reported being satisfied with their weight (13.2% of girls and 22.0% of boys, respectively) (Page et al., 2005). These Chinese girls also expressed great concerns about their body, and the desire for slimness was widespread.

Gender differences

Looking at body dissatisfaction throughout the lifespan, research is generally consistent in the finding that women of all ages report greater body dissatisfaction than men (Davis, 1997a; Grogan, 1999). Girls are more concerned with physical beauty, more likely to pursue an ideal body image and more likely to suffer negative health outcomes associated with body dissatisfaction (National Association of Social Workers, 2001). Among adolescent groups, it was found that girls were less satisfied with their bodies (McCabe et al., 2001; McGuire et al., 2002; Shih & Kubo, 2002) and more likely to report a desire to be thinner than boys (Gustafson-Larson & Terry, 1992; Kaneko et al., 1999).

Age differences

The desire to be thinner seems to have moved into early childhood from an adult's world (Lau et al., 2003). Fox (1997) indicated that children had already begun to rate themselves on a range of appearance factors by the age of 11 and had formed an opinion on whether or not they have an attractive appearance.

Currently, evidence has shown that children as young as six or seven years of age express body dissatisfaction and weight concerns (Ricciardelli et al., 2001a; Smolak, 2002; Thompson et al., 2002). In addition, body dissatisfaction appears to become more pronounced with increasing age among adolescent girls (Kaneko et al., 1999; Littleton & Ollendick, 2003; Ricciardelli et al., 2001a; Rosenblum & Lewis, 1999; Thompson et al., 2002). For example, McCabe et al. (2002) found that older adolescent girls were less satisfied with their weight and perceived more pressure from the media to decrease their weight than younger adolescent girls. Kaneko, et al. (1999) also observed a similar phenomenon. The number of girls who wanted to be thinner increased from 51% of 10-year-old girls to 87% of 17-year-old girls. Similarly, a fear of weight gain was reported by 35% of 10-year-old girls, and increased to 79% of 17-year-old girls. Another longitudinal study with 115 adolescents at ages 13, 15, and 18 years supported this view, which revealed that over adolescence, girls reported increased body dissatisfaction (Rosenblum et al., 1999).

Weight status (BMI)

Although research has indicated that adolescent girls who have a larger BMI desire to be thinner (Davis, 1997a; Levine et al., 2002; McCabe & Ricciardelli, 2003; Ricciardelli et al., 2001a), evidence also illustrates that many normal weight or even underweight adolescent girls express body dissatisfaction and engage in weight loss practices (Caradas et al., 2001; Kaneko et al., 1999; Lee et al., 1996).

A study revealed that more than 60% of 10-12-year-old girls, more than 80% of 13-15-year-old girls, and more than 90% of 16-17-year-old girls who were normal-weight desired thinness (Kaneko et al., 1999). Another survey showed that 27% and 33% of underweight and normal weight girls aged 15-18 in South Africa exhibited inappropriate eating attitudes and body shape concerns, respectively (Caradas et al., 2001). Lee et al. (1996) examined 1,581Chinese students in Hong Kong. The findings suggested that the majority of girls would like to weigh less even though they were not obese.

Overall, these studies indicated that related body image issues were found in adolescent girls regardless of ethnic background. Girls appear to express more dissatisfaction than boys and the prevalence demonstrated an increase with age during adolescence. More importantly, body dissatisfaction is not only limited to obese groups among adolescent girls.

2.2 Factors relevant to body image

Research has indicated that body image perceptions are derived from and maintained by a number of complex and interacting environmental and personal factors. Biology attempts to explain in 'objective' terms the functions and development of our bodies, and represents an important background for the study of body image (Loland, 1999). However, body image perceptions are not only determined by biology, but also depend on the particular psychological characteristics of the individuals and are significantly affected by sociocultural factors (Davis, 1997a; Grogan, 1999). In addition, some researchers view body image as a reflection of one's general self-worth and the image is profoundly influences by cultural ideals and social experiences (Levine et al., 2002; Ricciardelli et al., 2001a; Rice, 1996). Therefore, individual body image cannot be understood only by biological factors without examining the psychological, social, and cultural interactions.

2.2.1 Biological factors

Pubertal development

Adolescence is an important period in human development, marked by pronounced physical, psychological, emotional and social changes (Lobstein et al., 2004; National Association of Social Workers, 2001; Pesa et al., 2000). It represents a transition from childhood to adulthood (American Association of University Women, 1994; Dusek, 1996; Rice, 1996), with increasing cognitive and introspective abilities and growing interpersonal understanding (Rosenblum et al., 1999).

As adolescents mature, there is an increased value placed on peer acceptance and approval, and a heightened attention to external influences and social messages about cultural norms (National Association of Social Workers, 2001). They pay more attention to body appearance and become more concerned about body image in relation to norms, which is generally considered to be an important component of identity development (Rice, 1996; Usmini & Daniluk, 1997).

These biological changes of puberty influence psychological development through personal cognitions and sociocultural mediators (Dusek, 1996), which have also been implicated as triggers for body image problems for adolescents (Pesa et al., 2000).

McCabe and Vincent (2003) pointed out that pubertal maturation and the concomitant increase in body fat has been associated with greater levels of disordered eating among adolescent girls. Bodily concerns among girls around the time of pubertal development have been attributed to the normative increase in body fat that accompanies maturation. In general, girls tend to collect subcutaneous fat in the region of the pelvis, breast, upper back, upper arms, hips, and buttocks, which causes them to be more rounded and shifts girls further away from the thin ideal that is endorsed by society (Tiggemann, 2005). However, the increase in body fat for boys is associated with the acquisition of lean muscle mass, which moves boys closer to the male body shape that is reinforced by society, and so may be less likely to lead to weight loss behaviours (Dusek, 1996; Lobstein et al., 2004; McCabe et al., 2003).

Consequently, studies have shown that girls are generally more negative about their bodies (Ackard & Perterson, 2001) and puberty is associated with a rise in body dissatisfaction for adolescent girls (Franko & Striegel-Moore, 2002). For example, through Thompson's study (1990), the results suggested that girls who mature later (experience menarche after the age of 14) had a more positive body image than those who had their first menstrual period on time or early (before the age of 11). However, early maturation appeared to be associated with positive experiences for boys, since those maturing early had been found to have a more positive body image and more confidence than those maturing later.

Another review examining 5 studies with different ethnic groups revealed that timing of sexual maturation and body dissatisfaction was highly correlated. Girls with early onset menarche reported higher body dissatisfaction (Franko et al., 2002). Hermes and Keel (2003) examined the effects of puberty on the thin ideal body. They also found that girls who were more physically mature had significantly higher body dissatisfaction, and drive for thinness than did less-developed girls.

BMI

The issue of social reactions to increasing BMI might be particularly important during puberty (Smolak, 2002) and it is hardly surprising that BMI has consistently been found to correlate positively with measures of body dissatisfaction and of feeling fat (Davis, 1997a). For instance, a survey revealed that body shape concerns increased with increasing BMI in girls aged 15-18 in South Africa across all ethnic groups (Caradas et al., 2001). Other studies also revealed that BMI was positively associated with body dissatisfaction for adolescent girls (Fung et al., 2003; Lunner et al., 2000). A longitudinal study among 115 adolescents, assessed at ages 13, 15, and 18 years, illustrated that there was a low but significant correlation between body dissatisfaction and BMI at age 13 and 15 years, but no relation at 15 and 18 years (Rosenblum et al., 1999). The findings suggested that body dissatisfaction related to BMI might also differ with age.

However, the influence of weight on body dissatisfaction was not only related to actual body weight, but also related to perceptions of being overweight. One study from the U.S. National Youth Behaviour Survey (samples: 19,349), examining weight management among high school students, showed that for girls, 21.4% were overweight or obese, but 36.3% considered themselves to be overweight (Lowry et al., 2002). A similar phenomenon was observed in Taiwan. Wong and Huang (1999) found that only 16.2% of girls were overweight or obese, yet 51.4% of the girls perceived themselves as either overweight or obese.

All in all, the biological process moves most girls away from the dominant ideal body shape with increased body mass, a more negative body image, and higher levels of

drive for thinness (Levine et al., 2002). However, BMI is not the only contributor to body dissatisfaction, but also perceived body weight and other influences.

2.2.2 Psychological factors

Research has shown that body dissatisfaction is not only related to actual body size, as determined by BMI (e.g. Rosenblum et al. (1999)). This has led researchers to argue that body image is subjective, and open to change through psychosocial influences (Grogan, 1999).

Self-esteem

Perception of appearance is the strongest correlate of self-esteem for boys and girls compared to other life domains (Fox, 1997; Levine et al., 2002; Page et al., 1997). It has generally been found that self-esteem correlates with body dissatisfaction negatively, particularly for girls (Furnham et al., 2002; McCabe et al., 2003; Pesa et al., 2000; Sarlio-Lahteenkorva et al., 2003; Stein & Hedger, 1997; Tiggemann, 2005). People with high self-esteem tend to feel good about their bodies (Grogan, 1999). Hoare and Cosgrove (1998) examined the association among eating habits, body-esteem and self-esteem in Scottish children and adolescents. The results indicated a strong association between a low level of self-esteem and dislike of body shape. A longitudinal study assessed the relationship between body dissatisfaction and self-esteem in adolescent girls over a two-year time period, confirming a negative relationship between body dissatisfaction and self-esteem (Tiggemann, 2005). During childhood and adolescence, girls appear to internalise society's beliefs about the link between femininity, attractiveness, and slimness. Consequently, as girls go through adolescence and become more dissatisfied with body shape and appearance, this might affect their self-esteem adversely.

Perfectionism

Body dissatisfaction has also been found to be associated with perfectionism (Davis, 1997b; Ruggiero et al., 2003; Vohs et al., 1999; Vohs et al., 2001). Davis (1997b) examined body dissatisfaction and normal (positive) and neurotic (negative) perfectionism in 123 females with eating disorders The results showed that both normal and neurotic perfectionism were associated with lower body satisfaction. Ruggiero et al. (2003) assessed the relationships between perfectionism and body dissatisfaction/drive for thinness among female high school students in three different stress situations. Body dissatisfaction was found to be associated with perfectionism in all situations.

Additionally, studies also showed that a combination of body dissatisfaction, perfectionism and self-esteem might result in different weight control behaviours for individuals (Vohs et al., 1999; Vohs et al., 2001). Researchers suggested that perfectionists with high self-esteem who are dissatisfied with their bodies are presumed to be likely to view overweight as a temporary changeable situation. However, perfectionists with low self-esteem who are dissatisfied with their bodies are more likely to binge eat because they doubt their ability to lose weight (Vohs et al., 1999; Vohs et al., 2001).

To sum up, negative attitudes about the body have been associated with low-esteem and the relationship tends to be stronger for girls than boys across adolescence. Individuals who are characterised by high levels of perfectionism tend to show higher body dissatisfaction. It seems that low self-esteem and high perfectionism are common psychological correlates of weight and diet concerns, especially for girls.

2.2.3 Social factors

The role played by parents, peers, and media in influencing adolescent girls' body image concerns and weight-related behaviours has received increasing attention in recent years (Eisenberg et al., 2006; McCabe & Ricciardelli, 2005). After reviewing

studies on body image concerns, Ricciardelli and McCabe (2001a) found that mothers had been shown to act as role models and social reinforcers of adolescent girls' body image attitudes and behaviours. A history of teasing was found to determine body image concerns among adolescent girls, and the media was a further important transmitter of socio-cultural ideals about body size and shape. Research also illustrated that adolescent girls reported a fear of fat since media images placed pressure on them and that 'everyone around them', including family and friends, were concerned about weight and appearance (Rice, 1996). It indicated that social pressure to be thin derived from media and important others appears to be influential in the determination of body image perceptions among adolescent girls.

Images from the media

Research indicated that over a year, children and adolescents spend more time watching television than engaging in any activity other than sleeping (Tiggemann, 2002). The mass media are powerful conveyors of the socio-cultural ideal of thinness. It has been argued that this media presentation of thin images as the ideal is a major contributor to current high levels of body dissatisfaction in girls and women. In particular, fashion magazines are read by the majority of girls and young women (estimates up to 83%) (Grogan & Wainwright, 1996; Tiggemann, 2002). Tiggemann (2002) pointed out that:

> 'The media influence processes include social comparison, internalisation of the thin ideal, and investment in appearance for self-evaluation. When women compare their body with an image presented in the media, they almost invariably find themselves wanting. Repeated exposure to such images may lead women to internalise the thin ideal. ... Thus appearance becomes a core basis of self-evaluation, with self-worth contingent on meeting the social ideals. This schema is likely to exert particular salience in adolescence, when the major developmental task is the establishment of identity and when puberty moves girls away from, rather than toward, the thin ideal.' (p 92)

Research has evidenced that adolescent girls are regularly subjected to the slender beauty and idealised images in the media and results in increases in body dissatisfaction (Levine et al., 2002). Field et al., (1999) indicated that pictures in magazines had a strong impact on girls' perceptions of their weight and shape in their

study. Of the American girls among grades 5 to 12, 69% reported that magazine pictures influence their idea of the perfect body shape, and 47% reported wanting to lose weight because of magazine pictures. There was a positive association between the frequency of reading women's magazines and the prevalence of wanting to lose weight because of pictures in magazines, and feeling that pictures in magazines influence their idea of the perfect body shape.

Clay et al. (2005) examined the impact of media images on body satisfaction and self-esteem in adolescent girls aged 11-16. The findings revealed that viewing ultra-thin or average-size models led to decreases in both body satisfaction and self-esteem in this age group. Another study also found lower body satisfaction and mood following exposure to idealised female images among adolescent girls (Durkin et al., 2002). The authors suggested that it is likely that exposure to thin idealised images heightens awareness of perceived failure to meet the ideal and of perceived physical defects.

In a qualitative study, Wertheim et al. (1997) interviewed adolescent girls to examine the social pressures to be thin. The results suggested an important role of social influences in adolescent girls' weight concerns. Girls reported that the media portrayal of the thin ideal was a major pressure to be thin.

Groesz et al. (2002) adopted a meta-analytic technique to review related research about media influences and body image. They indicated that mass media such as fashion magazines and television promote a standard of slender beauty that led many girls to feel badly about their weight and shape. For many girls, these effects increased the frequency of negative emotion and the frequency with which they felt badly, not only about their bodies, but also about themselves. From reviewed articles, some studies have shown that girls ages 13-14 are more likely to compare themselves to slender models than girls ages 9-10 and that girls ages 10-25 who have low self-esteem and poor body image were particularly likely to seek out and 'enjoy' advertisements with slender, attractive models. They concluded that in general, body image for girls was more negatively affected after viewing thin media images than

after viewing images of average size models, plus size models, or cars and houses. More importantly, this effect was stronger for girls less than 19 years of age.

Tiggemann (2002) found no relationship or inconsistent relationships between media and body image. She assumed that women or girls who were most dissatisfied or invested in appearance seek out particular media content, such as fashion magazines. The assumption was supported by Botta (2003). The author examined the relationship between magazine reading and adolescents' body image and eating disturbances, which revealed that reading health/fitness magazine was an important predictor of body image and eating disturbances for adolescents. For girls, health/fitness magazine reading was linked to a stronger drive to be thin. For boys, reading was linked to increased muscularity. However, sports magazines were less likely to encourage obsessive attitudes or behaviours around body image and eating for adolescents.

Accordingly, media may have strong influences on body dissatisfaction for adolescents, whereas it might depend on the types or contents of the media. It might also be possible to use the media to promote a positive body image (Tiggemann, 2002).

Judgments and comments from others (family's and peers' feedback)

As adolescents' bodies are developing, they may receive judgments and comments about their body size or shape from family or friends. Through experiencing teasing or negative comments, they might feel shame, dissatisfaction, embarrassment, rejection, or even hate their growing bodies (Department of Health and Human Services, 2004). For example, Schwartz et al. (1999) investigated relationships between body image and parental feedback in 253 undergraduate students. The results demonstrated a general trend for girls to receive more feedback about appearance-related messages than boys and there were significant relationships between feedback and body satisfaction for girls. Moreover, fathers' and mothers' teasing about weight were predictive of daughters' body image. In a one-year follow-up study, Field et al. (2001) observed the relationships between weight concerns and social factors among preadolescents and adolescents. The data revealed that parents

transmitted weight-related issues, such as cultural values about desirable body weight and shape, to their children.

In addition, peers' influences are also important factors in understanding adolescents' body image perceptions. Abrams and Stormer (2002) surveyed a sample of 208 adolescent girls within different ethnic groups in the US. African American girls reporting a more ethnically diverse peer group showed higher awareness and internalisation of the thin ideal. The authors concluded that maintaining a friendship group within an ethnic minority context might protect African American girls from the influence of dominant standards of thinness.

However, peers' relationships might also lead to negative effects for adolescents. A history of frequent teasing on physical appearance by peers has been linked to higher levels of body dissatisfaction among adolescent girls across studies (Lunner et al., 2000; Smolak & Levine, 2002; Tantleff-Dunn et al., 2002; Thompson, 1990; Thompson, Coovert et al., 1995; Wertheim et al., 1997). For instance, a survey of adolescent girls from Sweden and Australia revealed a strong effect of teasing on body dissatisfaction (Lunner et al., 2000). A longitudinal study also confirmed that weight-teasing was associated with lower body satisfaction and provided evidence that weight-teasing predicted lower body satisfaction at five-year follow-up among adolescents (Eisenberg et al., 2006).

In conclusion, adolescent girls are highly influenced by media, family, and peers' judgments and comments. Mass media communications might be blamed for perpetuating an impossibly thin ideal as a model for girls to emulate, and such images have been castigated as causing the widespread use of excessive dieting or exercise behaviours. Nevertheless, they could also be used to promote healthy messages (Rice, 1996). Family and peers influences can therefore either be supportive or destructive.

2.2.4 Cultural factors

Societies construct ideal body figures in different ways. Researchers have illustrated that cultural background contributes to body shape ideals and there are significant cultural differences in the meanings associated with thinness and plumpness (Grogan, 1999; Kawamura, 2002; Lupinski, 2003). In poorer countries, thinness might be seen as a sign of poverty and disease, while increased weight might be viewed as positive and representing wealth (Grogan, 1999). In addition, body ideals vary among cultures through time as well as within cultures across groups (Jackson, 2002). The female ideals of beauty have changed over time and different ethnic groups may also reflect differences in the perception of body weight and dissatisfaction, even within the same country. As a result, in order to understand body image concerns, it is important to consider trends of the ideal female body through out history and to explore the influences of cultural variations in body dissatisfaction.

Historical trends of the ideal female body in the Western and Chinese world

Within Western industrialised culture, there have been many changes over the years in the female body shape and size from plumpness to slenderness that is considered attractive and healthy (Grogan, 1999). Anspaugh (2001) suggested that the ideal female body type is cyclical, going from thin to plump and back to thin again. He also pointed out that the beginnings of Western ideals of beauty might start with Classical Greece and continue to influence current views on beauty.

In Classical Greece, the ideal body type emphasised balance and harmony. For example, Venus (Figure 1) does not have an especially narrow waist and she is generally well proportioned (Eating Disorders Support, 2002). However, during the Middle Ages, the 'reproductive figure' was idealised by artists and plumpness signalling wealth, since a plump person had been able to eat well. Thinness was associated with poverty, low social status and infertility (Eating Disorders Support, 2002; Grogan, 1999). The 'fertility' idealisation led to the look of wide hips and a full bust and bottom, which could be seen in the paintings by the artist Rubens in the 17th century (e.g. Figure 2) and Courbet (1868) who painted 'La Source' (Figure 3). The nude presents a vigorous expression of youth and fertility.

Slimness in women was considered fashionable and erotic from the 1920s. The image of Twiggy (1960's) (Figure 4) revealed a hipless and breastless ideal in the 1960s and this desire to be extremely thin has continued into the 21st century. The pursuit of an ideal body has affected many women regardless of ethnic groups (Grogan, 1999). And the growth of research indicating that obesity is a major risk for various diseases (UK Department of Health, 2004; World Health Organisation, 2000, 2004a), might also encourage the vogue of thinness.

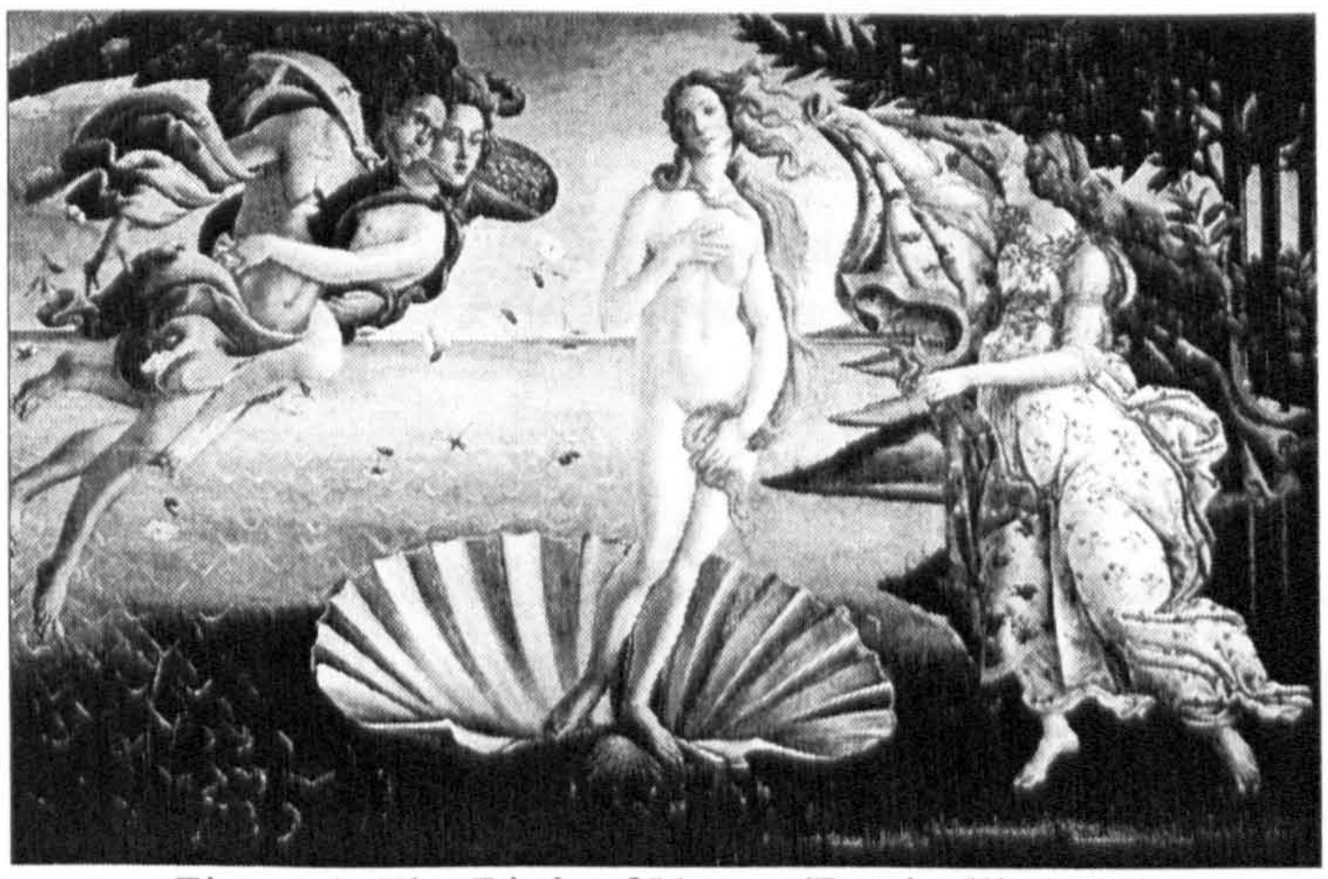

Figure 1: The Birth of Venus (Botticelli, 1482)
(http://www.windows.ucar.edu/tour/link=/mythology/Definitions_gods/Venus_def.html)

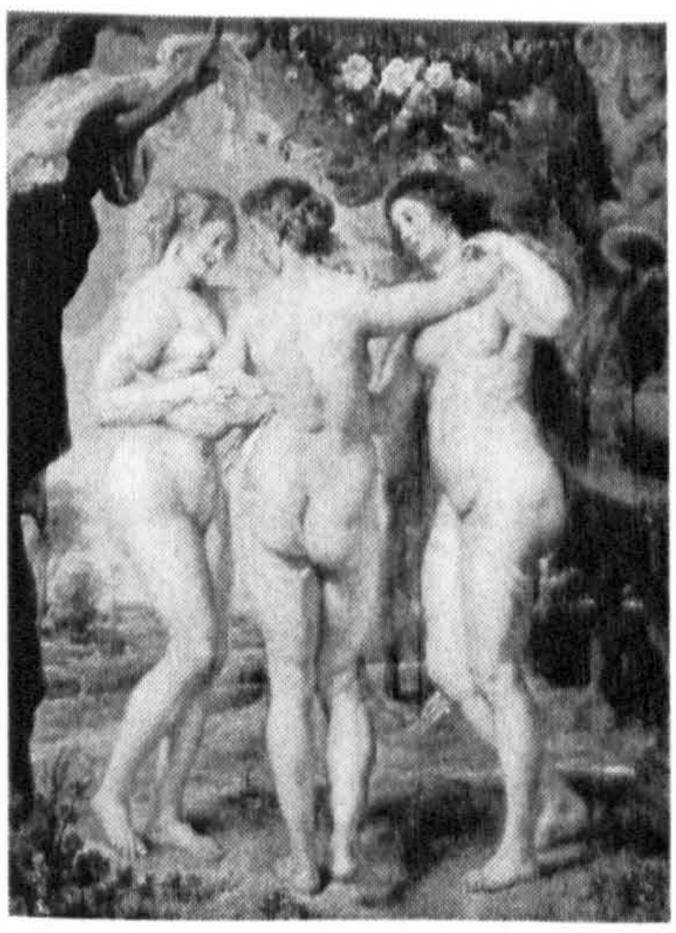

Figure 2: The Three Graces (Rubens, 17th Century)
(http://www.cusu.cam.ac.uk/campaigns/eds/femalebody.htm)

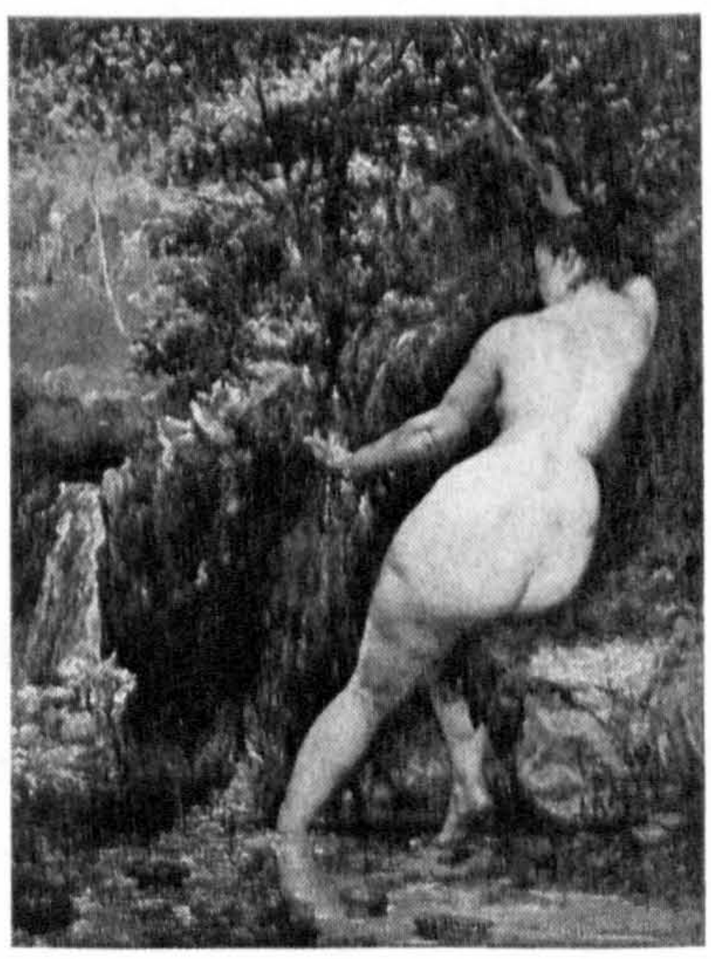

Figure 3: La Source (Courbet, 1868)
(http://www.npm.gov.tw/exhbition/adp1115/5.htm)

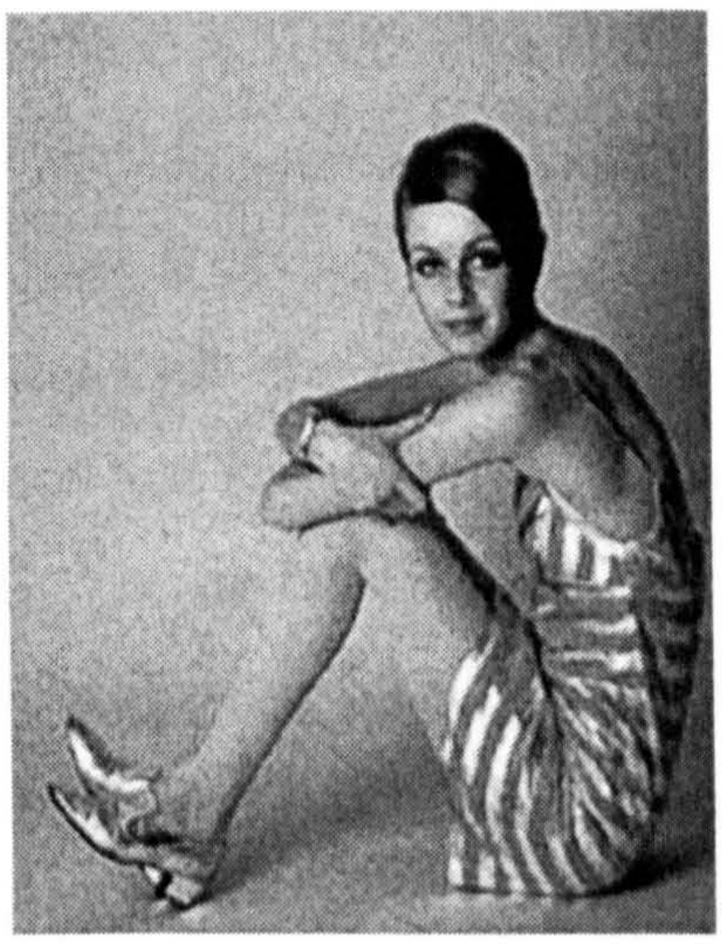

Figure 4: Twiggy (Eating Disorders Support, 2002)
(http://www.cusu.cam.ac.uk/welfare/eatingdisorders/femalebody.html)

Similarly, the standards of female beauty have also been modelled into different shapes throughout Chinese history (Siao, 2004; Taiwan National Palace Museum, 2003). Research has indicated the trends of ideal body shape in the Western world as mentioned above, while few studies have been reported in non-Western cultures (Anspaugh, 2001; Eating Disorders Support, 2002; Grogan, 1999). Therefore, this section traces the Chinese ideal female body through poetry, paintings, sculptures and contemporary women famous for their beauty to address the shifting ideals of female figures in Eastern culture and to compare these trends with the Western beauty.

Throughout Chinese history, trends in body shape varied across dynasties in very different ways from trends in the Western world. The image of full and rounded hips representing a symbol of fertility (Li, 2001) was valued in relatively short time periods. For instance, women in the Tang (618A.D.-907A.D.) dynasty appreciated a plump figure as a look of robustness. Nevertheless, it is an aesthetic rarely found in other periods (Taiwan National Palace Museum, 2003). The ideal image of Chinese feminine beauty conveyed from paintings and sculptures was fragile and wilting, which was evidenced in the period of Spring and Autumn Annals (481 B.C.-221A.D.), Hang (206B.C.-8A.D.), Sung (960A.D.-1279A.D.), Ming (1368A.D. -1644A.D.) and Ching (1644A.D.-1911A.D.) dynasties.

Prior to the Zhou period (1045B.C.-221B.C.), the ideal beauty for women was frail and wilting. An old Chinese saying 'a woman is too weak to withstand a gust of wind' gives the portrayal of what a woman ideal is like. For example, Xi-Shi (about 500B.C.) (Hua, 1979) (Figure 5) was the most famous of the four great beauties in Chinese history and it was said that she was frail and weak since she often suffered from pains of the heart. Whenever she felt the pains she would put her hand over her heart and cry. The villagers though that Xi-Shi was even more beautiful to look at when she put her hand over heart and frowned. Her name became synonymous with beauty in China (Taiwan Overseas Chinese Affairs Commission, 2004; Xu, 2000).

In addition, an old book 'Jian Ai' written by Mo (476B.C.-390B.C.) described that Chu, LingWang (about 540B.C.) loved tiny waists and the Chinese folk song 'Chu, LingWang loves tiny waists, everyone keeps a slender figure; three years without eating, everyone has a snaky waist' also reveals the popularity of slenderness.

Figure 5: Xi-Shi (Hua, 1979)
(http://www.2000y.net/100933/index.asp?xAction=xReadNews&NewsID=157)

During the Han dynasty (206B.C.-8A.D.), 'Zhao, FeiYen' (32B.C.-1A.D.) was a court dancer and was said to be a beautiful woman. It was her slender figure that won the attention of Emperor Cheng-Ti in Han period (206 B.C.- 8A.D.) (Taiwan National Palace Museum, 2003; Zhao & Hu, 2000). Two of the representative sentences for the description of her beauty were: 'She is afraid of the wind, since she is as light as a swallow', 'Dancing on the palm, as the music sound'. Accordingly, she became known as a 'flying swallow' (Zhao et al., 2000). Furthermore, 'The Ladies Book of Admonitions' also portrayed 'a woman's beauty lies in her weakness' (Pan, 25A.D.-220A.D.). These provided the clear images for female beauty in ancient China, which was weak, frail and wilting.

Under the Tang dynasty (618A.D.-907A.D.), China was renowned for a unified, prosperous, and highly civilised Empire. China's borders reached their greatest extent and the economy was prosperous. Due to extensive and frequent contact with foreign countries, the culture became more splendid, diverse and cosmopolitan and women enjoyed a high degree of personal freedom. The exhibited features markedly differed from that of preceding dynasties (Latourette, 1946; Lee, 2003; Peterson, 2000). The 'Tri-colour glaze pottery figure of a lady playing polo' showed a woman engaged in an active outdoor sport and her full-bodied and energetic figure was very different from that of the stereotypical and wilting 'Oriental Beauty' (Lee, 2003). Another example, the low-fried pottery of a standing lady also expressed the 'full-bodies' features of ladies (Figure 6) (Taiwan National Palace Museum, 2003).

The Chinese saying 'Plump Huan and Slender Yan' was used to describe the figures of charming Chinese girls. 'Huan' refers to Yang,Yu-Huna (716A.D.-756A.D.) (also called Yang, Gui-Fei) (Siao, 2004) (Figure 7), who was favourite of Emperor Ming during the Tang dynasty owing to her plumpness; 'Yan' refers to Zhao, Fei-Yan in the Han dynasty (206B.C.-8A.D.), who won the favour of Emperor Cheng-Ti because of her slenderness. The plump figure was regarded as beautiful in Tang period, which varied from the previous time.

Figure 6: A standing lady (Taiwan National Palace Museum, 2003)

Figure 7: Yang, KueiFei (Siao, 2004)
(http://www.2000y.net/100933/index.asp?xAction=xReadNews&NewsID=157)

In contrast to the Tang dynasty, women were encouraged to stay indoors after this period, along with the establishment of the footbinding custom. Spence and Chin (1996) indicated that footbinding was introduced in the eleventh century. Girls as young as three or four would had their feet bound tightly with bandages, folding all the toes except the big one under the sole to make the foot slender and pointed. After a couple of years, the big toe and heel were brought together, bending the arch, causing constant pain and hindering free movement. The sight of a women teetering on her little points moving her hips from side to side 'like a tender young willow in a breeze' to balance herself was believed to have an erotic effect upon men. In addition, the Chinese court and the upper class had always prized small feet in women. It became an important symbol of high status within Chinese society. A woman without small feet was regarded as disgraced (Latourette, 1946). The ideal length was known as 'three-inch golden lotus'. Subsequent to footbinding and during adolescence and the beginning of marriage, young girls were increasingly confined to domestic spaces, which was only three courtyards within which they came to live their life (Croll, 1995). Therefore, the physical limitation meant women could not run or even barely

able to walk and kept them in a hobbled and subservient domestic state (Croll, 1995; Ko, 1997; Spence et al., 1996). Hesse-Biber (1996) illustrated that the custom lasting about a thousand years served virtually to cripple women in the name of beauty and femininity for Chinese women.

The historical trend of the ideal female body is presented in Table 1. The artistic interpretation helps to explore the notion of ideal body type.

Table 1: Historical trends of ideal female body in the Western and Chinese world

Year	Area	Body shape preference	Representative	Reference
~221B.C.	Western	NA	NA	NA
	Chinese	Sick, frail and wilting beauty	Chinese saying: Tung-Shi Imitates Xi-Shi's Frown	(Taiwan Overseas Chinese Affairs Commission, 2004)
			Painting: Xi-Shi [a]	(Hua, 1979)
			Chinese Folk Song: Chu, LingWang loved tiny waists [b]	(Mo, 476B.C.-390B.C.)
206B.C.~8A.D. (Han dynasty)	Western	NA	NA	NA
	Chinese	Fragile and wilting ideal	Poem: Han Gong Cyu [c]	(Syu, 618A.D-907AD)
618A.D.~907 (Tang dynasty)	Western	NA	NA	NA
	Chinese	Full and fleshy figure	Paintng: Yang, KueiFei [d]	(Siao, 2004)
		Plump and rounded face	Pottery: a standing lady [e]	(Taiwan National Palace Museum, 2003)
		Heavy and robust body	Painting: Beauties on an Outing [f]	(Li, 1049 - 1106)
960 ~1500s	Western	Well proportioned Balance and harmony	Painting: The Birth of Venus [g]	(Botticelli, 1482)
(Song dynasty)	Chinese	Graceful and plaintive beauty	Painting: Lady with Fan [h]	(Tang, 1470-1523)
1600s ~1900s	Western	Full, rounded hips and breasts, healthy looking, plump figure	Painting: La Source [i]	(Courbet, 1868)
(1368~1911) Ming, Ching dynasty	Chinese	Frail beauty	Painting: 2nd Portrait of Chiao-Niang [j]	(Chen, 1639)
			Painting: Court Ladies [k]	(Chiao, 1689-1726)
~1920s	Western	Breastless, hipless ideal	Magazines	(Grogan, 1999)
	Chinese	NA	NA	NA
~1940s	Western	Shapely figure, breasts Tiny waists, slim legs	Miss American, Jane Russell Hollywood film, Playboy magazine	(Grogan, 1999)
	Chinese	NA	NA	NA
~1960s	Western	Flat-chest, boyish figure	Twiggy [l]	(Eating Disorders Support, 2002)
	Chinese	NA	NA	NA
~1980s	Western	Slim and fit With lithe, toned body	Vogue magazine	(Grogan, 1999)
	Chinese	Shapely figure	Miss Hong Kong	(Hong Kong Television Broadcasts Limited, 2004)
~1990s	Western	Very thin body type Like heroin users	Kate Moss 'Waif' model	(Grogan, 1999)
	Chinese	Shapely figure	Miss Hong Kong	(Hong Kong Television Broadcasts Limited, 2004)

NA: Not Available

[a]: Xi-Shi was the most famous of the four great beauties in Chinese history. See figure 5, which was painted in the 20 century according to Chinese saying and anecdotes.

[b]: Chinese Folk Song about Chu, LingWang was as followed:
'Chu, lingWang loves tiny waists, everyone keeps a slender figure; three years without eating, everyone has a snaky waist.'

[c]: Many poems portrayed the beautiful woman 'Chao, FeiYen'. It was her slim figure that won the attention of Emperor Cheng-Ti in Han period (206 B.C.- 8A.D.) (Taiwan National Palace Museum, 2003). Two of the representative sentences for the description of her beauty were: 'she is afraid of the wind, since as light as a swallow'; 'dancing on the palm, as the music sound'.

[d]: Yang, KueiFei, the most infatuated concubine of Emperor Ming-Huang of the Tang dynasty (618-907), remains the most famous 'plump' beauty in Chinese history (Taiwan National Palace Museum, 2003). She was also one of the four most beautiful women in ancient China. See figure 7, which was painted in the 20 century according to Chinese saying and anecdotes.

[e]: See figure 6. [f]: See figure 8. [g]: See figure 1. [h]: See figure 9. [i]: See figure 3.
[j]: See figure 10. [k]: See figure 11. [l]: See figure 4.

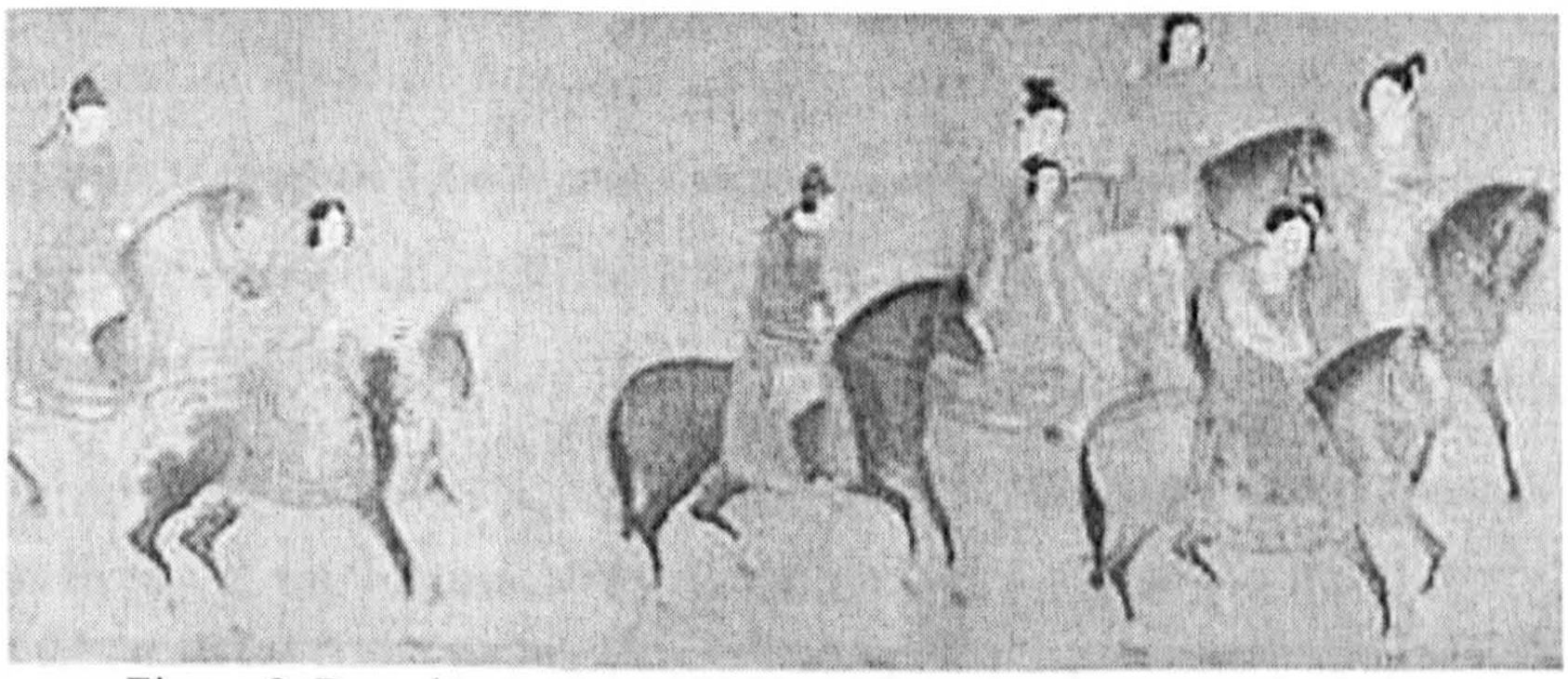

Figure 8: Beauties on an Outing (Li, 1049 - 1106) (Peterson, 2000)

Figure 9: Lady with Fan (Tang, 1470-1523) (http://www.chinapage.com/main2.html)

Figure 10: 2nd Portrait of Chiao-Niang (Chen, 1639) (http://www.npm.gov.tw/exh91/ban0104/b.htm)

Figure 11: Court Ladies (Chiao, 1689-1726) (http://www.chinapage.com/main2.html)

For the twentieth century, beauty pageants may be another tradition through which society defines its ideal of beauty including body weight and shape (Rubinstein & Caballero, 2000). Figure 12 reveals the average BMI values for winners of both Miss Hong Kong and Miss America from 1973 to 2002 (American Express, 2004; Hong Kong Television Broadcasts Limited, 2004) (some years are not available due to the lack of weight or height in the winners of Miss Hong Kong or America). Winners of the 'Miss Hong Kong' from 1973 to 2002 had an average BMI 17.7, with some having a BMI as low as 16.2, all recognised as underweight (International Obesity Task Force, 2000). Although some winners of Miss America were in the normal range, the majority were underweight. The information appeared to support that thinness is still considered to be beautiful and ideal in contemporary time in both Chinese and western countries.

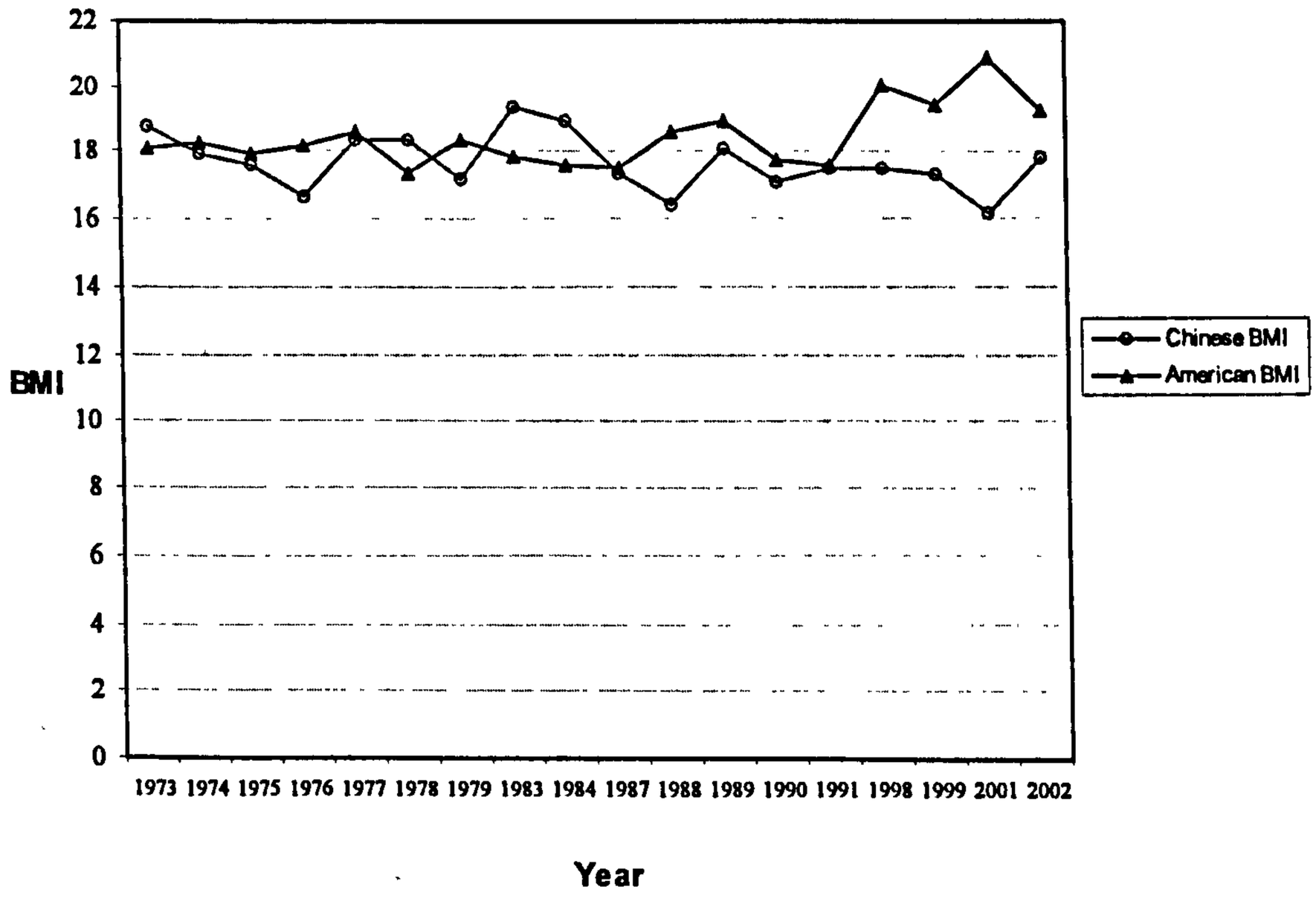

Figure 12: BMI of the winners of Miss Hong Kong and American pageants
Source: (American Express, 2004) & (Hong Kong Television Broadcasts Limited, 2004)

Cultural variations in body dissatisfaction

Cultural variations in attitudes to body size have been reported in many studies. Most research has found that body dissatisfaction is the most frequent in White women

(Crago et al., 1996; Field et al., 1999; Franko et al., 2002; Grogan, 1999; Lowry et al., 2002; Neff et al., 1997). For example, a meta-analysis, involving 35 studies from over 17,000 participants examining body dissatisfaction in white and non-white populations, revealed a relationship between ethnicity, culture, and eating disturbance. The findings showed that, as a whole, white women living in Western countries experience greater body dissatisfaction than non-white women across all measures examined (Wildes et al., 2001). Likewise, several studies found that White females in the U.S. were more likely to consider themselves to be overweight, more likely to be trying to lose weight and more likely to engage in unhealthy weight management practices than other groups (Crago et al., 1996; Field et al., 1999; Lowry et al., 2002; Neff et al., 1997).

In the UK, Wardle and her colleagues (1993) studied body image and dieting concerns in a sample of 274 white and Asian British women aged 14-22. The Asian women were less likely to describe themselves as too fat, less dissatisfied with their body size and less likely to want to lose weight. Some of these differences were due to the generally lower body weight in the Asian group. However, when the researchers controlled for the effects of the body size they found that white women still felt larger than Asian women of the same size. Chen and Swalm, (1998) also observed the phenomenon among 289 Chinese students in China and 180 American students in the US, which suggested that American students were significantly more likely than Chinese students to perceive their body shapes as being larger.

In general, current data suggest that White women are at more risk of 'feeling fat' than other ethnic groups (Grogan, 1999). However, some studies showed a higher prevalence of body dissatisfaction in Chinese compared to White women. Davis and Katzman (1998) found that, on the whole, Chinese students in Hong Kong reported significantly more body and weight dissatisfaction as compared to their cohorts in the US. Shih and Kubo (Shih et al., 2002) also indicated that the percentage of body dissatisfaction for Chinese in Taiwan was higher than that for Americans when compared with other studies.

Section summary

To sum up, body image concerns are at the peak during adolescence, due to the body changes, which may move girls away from a slender ideal. Researchers have indicated that 'adolescent women and girls may find it particularly difficult to challenge dominant cultural representations of femininity at a time when they are still learning about what it means to be a woman in society, and when they were experiencing changes in body shape and size as they move into womanhood'(Grogan et al., 1996) (p 672).

There are many factors contributing to the development of body image. Greater weight may cause an increase in teasing and poor body image. Subjects' perceived weight (how they categorised their own weight) is also positively related to body image disturbance (Thompson, 1990). In addition, the thin ideal is conveyed and reinforced by media, family, and peers (Groesz et al., 2002). Through social feedback, the views others have of us come to influence the views we have of ourselves (Rosenblum et al., 1999). However, there can be no doubt that idealisation of slenderness varies depending on cultural factors. A person's body image is not only determined by the actual shape and size of that body, but also by that person's subjective evaluation of what it means to have that kind of body within their particular culture (Grogan, 1999).

2.3 Health consequences of obesity

Evidence suggests that there is a growing proportion of overweight and obesity in children and adolescents, and the problems might get even worse in the coming decades (Bouchard, 2000; International Obesity Task Force, 2002; Lobstein et al., 2004; North American Association for The Study of Obesity, 2003; World Health Organisation, 2000). Among American adolescents, overweight prevalence has nearly tripled in the past two decades (Department of Health and Human Service, 2001). In Europe and Asia, available data from various estimates also revealed that childhood obesity has increased steadily and the emerging obesity problem could not be ignored (Lobstein et al., 2004; Savva et al., 2002; Tee, 2002; UK Department of Health, 2003; UK House of Commons, 2004). Obesity during early years is associated with risk factors and related physical and psychosocial consequences (Daniels et al., 2005; Dietz, 1998; Edmunds et al., 2001; Hill & Lissau, 2002; Loke, 2002; Must & Strauss, 1999; Regan & Betts, 2006; Wabitsch, 2000b). The possible adverse effects of childhood obesity are summarised in Table 2.

Table 2: Consequences of childhood obesity

Early consequences of childhood obesity
Physical consequences
Orthopaedic complications
Metabolic disturbances
Elevated blood pressure and hypertension
Sleep apnoea syndrome
Liver steatosis cholesystolithiasis
Psychosocial consequences
Social stigmatisation (discrimination)
Lower self-esteem
Negative body image
Late consequences of childhood obesity
Persistence of early co-morbidities
Obese adults
Cardiovascular disease
Cancer

Sources: (Daniels et al., 2005; Dietz, 1998; Edmunds et al., 2001; Hill et al., 2002; Loke, 2002; Must et al., 1999; Regan et al., 2006; Wabitsch, 2000b)

2.3.1 Physical consequences

Childhood obesity is associated with metabolic disturbances, orthopaedic and other early complications, resulting in many chronic diseases (Dietz, 1998; Edmunds et al., 2001; Loke, 2002; Must et al., 1999; Wabitsch, 2000b). Dietz (1998) indicated that because the tensile strength of bone and cartilage did not evolve to handle substantial quantities of excess weight, a variety of orthopaedic complications accompany childhood and adolescent obesity. The orthopaedic complications such as genu valga, Blount disease and epiphysiolysis capitis femoris affect the ability of children and adolescents to exercise. Thus, it commences a vicious cycle with increasing and worsening obesity problems (Loke, 2002). In addition, childhood obesity has been shown to be associated with increased levels of low-density lipoprotein-cholesterol and triglycerides and decreased levels of high-density lipoprotein-cholesterol (Dietz, 1998; Wabitsch, 2000b). Other less common medical problems in early life (e.g. type 2 diabetes, hypertension) have also been found in obese children and adolescents (Dietz, 1998; The Association for the Study of Obesity, 2004; Wabitsch, 2000b).

2.3.2 Psychosocial consequences

The most widespread consequences of childhood obesity might be psychosocial (Dietz, 1998) because few problems in childhood may have as significant an impact on childhood emotional development as obesity (Must et al., 1999). Obese persons might be socially stigmatised as lazy, sloppy, dirty, ugly or stupid by others (Must et al., 1999; Schwartz & Puhl, 2003). The psychosocial discrimination of obese children and adolescents may contribute to social isolation and has consequences for psychological and behavioural development (Edmunds et al., 2001; Hill, 2004; Loke, 2002; Strauss & Pollack, 2003; Wabitsch, 2000b). A study investigated social networks of overweight and normal weight adolescents in a national representative sample (Strauss et al., 2003). The results showed that overweight adolescents received fewer friendship nominations than normal weight adolescents and are less likely to be named as a friend by those who they nominated. It suggested that the

overweight adolescents had more isolated and peripheral relationships than the normal weight individuals.

Middle childhood is a critical period for the development of body image and self-esteem (Must et al., 1999). Increased body circumference would affect the appearance of obese children and adolescents (Wabitsch, 2000b). Studies have shown clearly that children at a young age have begun to incorporate cultural preferences for thinness and express body dissatisfaction (Hill et al., 1994; Thompson et al., 2002). Body image dissatisfaction is common in obese children and adolescents. Some obese girls describe themselves as 'ugly and despicable', and viewed themselves with hostility and contempt (Loke, 2002). Studies also suggested that obesity was associated with lower self-esteem (French et al., 1995; Young-Hyman et al., 2003). Research on the relationship between obesity and self-esteem among children and adolescents has been reviewed by French et al. (1995). The results revealed that 13 out of 25 cross-sectional studies showed significantly lower self-esteem in obese children and adolescents. The clearest effects were found among adolescents aged 13-18, where seven of the nine cross-sectional studies found an inverse relationship between obesity and self-esteem. These findings are also in agreement with the results of Young-Hyman et al. (2003). Loke (2002) illustrated that detrimental consequences of poor self-esteem increased rates of sadness and loneliness in obese adolescents compared to the non-obese. Therefore, obese individuals might have an increased risk of behaviour and psychosocial problems, which can persist into adulthood (Edmunds et al., 2001; Loke, 2002; Young-Hyman et al., 2003).

2.3.3 Persistence of obesity into adulthood and long-term consequences

Studies have showed that adolescent obesity has a great likelihood to persist into adulthood. After reviewing epidemiological studies from 1970 to 1992, Serdula et al. (1993) reported that the risk for becoming an obese adult was at least twice as high for obese children than non-obese children. Another study (Vanhala et al., 1998) found that half of the obese children had become obese adults, with an especially high

risk of metabolic syndrome and childhood obesity increasing the risk for metabolic syndrome in adulthood. The findings suggested that obesity in adulthood established in childhood might be more harmful than obesity appearing in adulthood (Vanhala et al., 1998). A 55 year follow-up study (Must et al., 1992) also found that being overweight in adolescence was associated with an increased risk of mortality in men. The risk of morbidity from coronary heart disease and atherosclerosis was increased in both men and women who had been overweight in adolescence. Colorectal cancer and gout were increased in men, and arthritis was increased in women (Must et al., 1992). A national longitudinal survey showed that obese women were less likely to be married, had lower incomes, had higher rates of poverty, and had completed fewer schooling than the non-obese women (Gortmaker et al., 1993).

All in all, the increase in the prevalence of obesity among children and adolescents is alarming. Increased cardiovascular risk factor levels and several adverse consequences for physical health in obese children and adolescents lead to increased morbidity even in early life, as well as to an increase in mortality in late adulthood (Wabitsh, 2000). The findings call for action to prevent obesity starting early in life which might lead to prevent adult obesity, the metabolic syndrome, cardiovascular risk, and other health problems (Vanhala et al., 1998).

2.4 Influences of physical activity

There is a wealth of data on the health benefit of physical activity for adults. Although the evidence base is weaker for youth than that for adults, some evidence has shown that physical activity has positive effects in young people on some health outcomes, including enhancement of psychological well-being, decrease of body fat, and beneficial association with chronic disease risk factors (Biddle et al., 1998).

2.4.1 Physical activity and physical health

Overall, from reviewed studies, the main influences of physical activity on physical health comprise three aspects: (1) reducing cardiovascular disease risk factors, including aerobic fitness, blood pressure, and lipid and lipoprotein metabolism; (2) improving skeletal health and growth; (3) preventing obesity and fatness. Review studies provide more confidence about the positive link between physical activity and physical health (Alpert & Wilmore, 1994; Armstrong & Simons-Morton, 1994; Baquet et al., 2003; Bar-Or & Baranowski, 1994; Eliakim & Beyth, 2003; Riddoch, 1998; Thompson et al., 2003; Tolfrey et al., 2000). Although not all research found significant associations with physical activity and some relationships were weak, many studies still showed positive associations between physical activity and physical health among youth.

Cardiovascular disease risk factors

In adults, there already is evidence that physical activity and/or fitness has a favourable effect on lipoprotein levels. Although little has been written on the relationship between physical activity or physical fitness and coronary heart disease in young populations (Thompson et al., 2003), recent research suggests a favourable relationship between physical activity and factors associated with metabolic syndromes among adolescents.

For lipids and lipoproteins, Riddoch (1998) reported that among reviewed articles, six studies showed no significant association with activities and five studies showed some associations, but the patterns of association were inconsistent. However, Armstrong and Simons-Morton (1994) concluded in their review that high-density

lipoprotein cholesterol concentrations might be enhanced, although data suggesting a beneficial effect of activity on lipids and lipoproteins were minimal. In addition, Tolfrey et al. (2000) reviewed the effect of aerobic exercise training on the lipid-lipoprotein profile of children and adolescents. They concluded that cross-sectional comparisons of dichotomised groups provide the strongest evidence of an exercise effect and the evidence suggests that a 'favourable' lipoprotein profile may be related to higher levels of habitual physical activity.

Regarding blood pressure, Alpert and Wilmore (1994) concluded that exercise training had only a weak relationship with blood pressure within the normal range, but aerobic-type training consistently reduced both systolic and diastolic blood pressure in hypertensive adolescents. Riddoch (1998) pointed out that, in reviewed articles from 1992-1997, two studies reported no association between blood pressure and physical activity, whereas six studies reported a positive association. Ewart et al. (1998) evaluated the effects of aerobic exercise physical education on blood pressure in high-risk adolescent girls, reporting that the aerobic exercise group had a greater decrease in systolic blood pressure than the standard physical education group and members of the aerobic exercise group increased their estimated cardiorespiratory fitness.

Another review analysed 22 studies regarding endurance training and aerobic fitness in young people. It revealed that aerobic training leads to a mean improvement of 5-6% in the peak VO2 of children or adolescents. When only studies that reported significant training effect were taken into account, the mean improvement in peak VO2 rose to 8-10% (Baquet et al., 2003).

From the literature reviewed in Table 3, information suggests that physical activity exerted a protective effect on cardiovascular health (Abbott et al., 2002; Colchico et al., 2000; Jamner et al., 2004). Moreover, physical activity was associated with a favourable serum lipid profile already during childhood and early adolescence (Raitakari et al., 1997), where the relationships were stronger for boys rather than

girls and for older rather than younger children (Boreham et al., 1997; Raitakari et al., 1997).

Obesity and fatness

Research has shown that an active lifestyle is considered to have a beneficial effect on body fatness (Thompson et al., 2003) and increasing levels of physical activity are associated with a lower BMI and less TV watching (Eisenmann et al., 2002). However, one study found physical activity had no effect on BMI after a four-months intervention project (Jamner et al., 2004). The authors explained the reason might be that intervention girls increased their caloric intake to compensate for the increased energy expenditure.

Janz et al. (2002) assessed aerobic fitness, muscular strength, vigorous and sedentary activity, maturation, blood pressure, lipids, and body composition in 125 healthy children for a period of five years. They concluded that childhood health promotion programs that specifically target increases in physical fitness may help to reduce the increasing prevalence of adolescent obesity. Bar-Or and Baranowski (1994) reviewed studies related to physical activity and obesity. They found several cross-sectional studies suggested that obese youth were less physically active than those who were not obese and many interventional studies in the general adolescent population showed a small (1-3% body fat) reduction in adiposity as a result of physical training.

Skeletal (bone) health and development

Bailey and Martin (1994) indicated that although there were gaps in our knowledge of the precise role of physical activity in bone mineral accretion during the growing years, there had been a number of studies that reported associations between bone mineral density and physical activity in the under 21 age group. They identified some beneficial effects of activity on children's skeletal health. They also suggested activities that increased muscle strength should be promoted and short bursts of intense daily activity were better than irregular activities. They also pointed out the deleterious effects of immobility and inactivity, especially the shortage of weight bearing activities on the skeleton.

Riddoch (1998) reviewed 10 articles, which lend support to the view that activity can enhance a range of parameters related to skeletal health in adolescents, with a few exceptions. He concluded that although associations between activity and various aspects of skeletal health in children were weak, there were indications that some of the more natural play-like activities of children that involved running, skipping and jumping may in-deed be beneficial to bone health.

Table 3 shows summaries of research findings relating to the influences of physical activity for aerobic fitness, blood pressure, lipid profile, obesity, diabetes, bone health and other influences, consisting of the sample description, study design, and major outcomes. The reviews are presented first in the table, followed by individual studies not included in the reviews.

Table 3: Studies of the associations between physical activity and physical health

Category	Authors	Participants and Study design	Measures	Main findings
Cardiovascular disease (CVD)				
Reviews	(Alpert et al., 1994)	Review (before 1993) in adolescents aged 11-21; 29studies	PA; blood pressure	1. Exercise training had only a weak relationship with blood pressure in normotensive adolescents. 2. Aerobic-type exercise training consistently reduced both systolic and diastolic pressure in hypertensive adolescents, but not to the normal levels.
	(Armstrong et al., 1994)	Review; 30studies	PA; blood lipids	1. More convincing evidence for a beneficial effect of physical activity on blood lipids is apparent in cross-sectional studies.
	(Riddoch, 1998)	Review (1992-1997) in children and adolescents; 46 studies (15 studies addressing PA and CVD)	PA; lipids and lipoproteins; blood pressure	1. 6 studies showed no association with PA; 5 studies showed some association with PA, but the patterns of association were inconsistent. 2. 2 studies reported no association with PA; 6 studies reported a positive association with PA. 3. PA has only weak associations with serum lipid and lipoprotein concentrations and with blood pressure.
	(Tolfrey et al., 2000)	Review (1978-1998) in children and adolescents; 14 studies	PA; fitness; HDL-C; LDL-C; TC; TG	1. The evidence regarding LDL-C is equivocal. 2. The evidence suggested that a 'favourable' lipoprotein profile might be related to higher levels of habitual PA. 3. Longitudinal studies showed that exercise had little influence on the lipoprotein levels of children and adolescents.
	(Baquet et al., 2003)	Review (1987-2003) in children and adolescents; 22 studies	Fitness; VO_2; heart rate	1. Aerobic training led to a mean improvement of 5-6% in the peak VO_2 of children and adolescents. 2. Intensities higher than 80% of maximal heart rate are necessary to achieve a significant improvement in peak VO_2.

	(Thomas et al., 2003)	Review (1972-2002) in children and adolescents; 31 studies	PA; fitness; HDL-C; blood pressure	1. Some studies showed that decreased blood pressure levels were associated with increased levels of PA, while others have failed to confirm this link. 2. Several studies had failed to identify significant differences between the lipid profiles of active and sedentary young people, whereas others had confirmed that active children had higher HDL-C and lower TG levels. 3. Data on children were inconclusive. The effects of PA or fitness on the CHD risk factors were equivocal.
Individual studies	(Schmidt et al., 1998)	Cross-sectional study (N=1579) in youth aged 6-18	PA; resting blood pressure; fasting plasma lipids and lipoproteins; glucose	1. PA was significantly correlated with total cholesterol and triglycerides for boys. 2. Significant differences were found between PA groups and total cholesterol.
	(Colchico et al., 2000)	Experimental study in adolescent girls aged 11-14 (12 weeks; intervention, N=30; no control group)	PA; fitness	1. One week after completion of the 12-week program, there were significant improvements in cardiovascular endurance, muscular strength and endurance and flexibility. 2. Significant improvements in fitness of high-risk youth through participation in PA.
	(Schmitz et al., 2002)	Cross-sectional study (N=357) in non-diabetic children aged 10-16	PA; insulin sensitivity	1. PA was significantly correlated with fasting insulin and insulin sensitivity, more strongly in children with above-median systolic blood pressure.
	(Wedderkopp et al., 2003)	Cross-sectional in 1020 randomly selected children and adolescents aged 9 and 15	Physical fitness; CVD risk factors	1. Physical fitness was weakly related to single CVD risk. 2. Low fitness increased the risk of having three or more CVD risk factors.
	(Jamner et al., 2004)	Experimental study (control, N=22; intervention, N=25) in sedentary adolescent females after 4 months follow-up	PA; VO_2; life style	1. A school-based intervention targeting sedentary adolescent females can increase physical activity and prevent a decline in cardiovascular fitness

Obesity				
Reviews	(Bar-Or et al., 1994)	Review (before 1993) in adolescents aged 11-21; 21studies	PA; adiposity; obesity	1. Cross-sectional studies suggested that obese children were less physically active than the non-obese. 2. Intervention studies showed a small (1-3%body fat) reduction in adiposity as a result of physical training in the general adolescent population.
	(Riddoch, 1998)	Review (1992-1997) in children and adolescents; 46 studies (8 studies addressing PA and obesity)	PA; obesity; overweight	1. 2 studies observed no effects, while others showed a negative association between PA and fatness. 2. There were small but significant beneficial effects, in terms of reduced fatness, as a result of increase PA.
	(Thompson et al., 2003)	Review (1972-2002) in children and adolescents aged 5-29; 31 studies	PA; fitness, obesity	1. Several studies showed a negative association with body fatness and cardiorespiratory fitness or activity in adolescents.
Individual studies	(Schmidt et al., 1998)	Cross-sectional study (N=1579) in youth aged 6-18	PA; fatness	1. PA was significantly correlated with body fat and BMI for girls. 2. Significant differences were found between PA groups and fat.
	(Colchico et al., 2000)	Experimental study in adolescent girls aged 11-14 (12 weeks; intervention, N=30; no control group)	PA; fatness	1. After a 12-week program, body mass index and tricep skinfold decreased minimally but significantly.

(Eisenmann et al., 2002)	Cross-sectional study with a nationally representative sample of 15,143 high school students	PA; obesity; TV watching	1. Increased levels of PA are associated with a lower BMI and less TV watching. However, the relationship between TV watching and weight status is more pronounced.
(Ekelund et al., 2002)	Case-control study in adolescents aged 14-19; control, N=36; obese, N=18;	PA; obesity	1. Obese adolescents are less physically active, but there were no significant differences in the energy cost of PA between groups.
(Salbe et al., 2002)	Cross-sectional study (N=138) in children aged 5 and 10	PA; TV viewing; fatness	1. Percentage of body fat and body weight at 5 and 10 years of age were negatively correlated with sports participation and positively correlated with television viewing. 2. Obesity is associated with decreased participation in sports and increased television viewing.
(Levin et al., 2003)	Cross-sectional study with a nationally representative sample of 13295 schoolchildren	PA; obesity	1. Adolescent boys who were underweight or overweight were less likely to be physically active than boys of normal weight 2. Adolescent girls who were overweight or obese were less likely to be involved with sports than normal weight girls 3. Weight status among high school students is correlated with selected PA behaviour, especially in adolescent boys
(Christodoulos et al., 2006)	Longitudinal study over one year on 178 Greek primary school children	Organised PA, fitness, obesity	1. Sufficiently active children (> 30 min/day of PA) demonstrated significantly superior fitness performance. 2. Sufficiently active children showed significantly lower prevalence of being overweight and obese.

Skeletal health

Reviews	(Bailey et al., 1994)	Review (before 1993) in adolescents aged 11-21; 21studies	PA; skeletal growth; bone density	1. The long-term effects of PA on bone accretions were incomplete. 2. 2 trials reported only modest or no benefits from resistance training programs. 3. Only some beneficial effects of activity on children's skeletal health.
	(Riddoch, 1998)	Review (1992-1997) in children and adolescents; 46 studies (10 studies addressing PA and skeletal health)	PA; skeletal growth	1. 3 studies showed no association with PA; 7 studies showed positive associations. 2. Activity could enhance a range of parameters related to skeletal health in children.
	(Eliakim et al., 2003)	Review in children and adolescents	Exercise; bone development	1. Weight bearing PA and increased mechanical loading have beneficial effects on bone mineralisation and development in children and adolescents, and in particularly during periods of rapid bone growth such as early pubertal and the premenarchal years.
	(Kohrt et al., 2004)	Review	PA; bone health	1. Bone mass was higher in children who were physically active than those were less active, and higher in children who participated in activities that generated high impact forces (e.g., gymnastics and ballet) than in those who engaged in activities that imparted lower impact forces (e.g., walking) or were not weight bearing (e.g., swimming).
Individual studies	(Kujala et al., 1999)	Cross-sectional study in 698 schoolchildren aged 10-17	PA; pain symptoms	1. Musculoskeletal pains (in particular low back pain, upper limb pain, and lower limb pain) were found more often in subjects participating in large amounts of leisure PA 2. While non-musculoskeletal pains (in particular headaches among boys) tended to be less common.
	(Janz et al., 2001)	Cross-sectional study; 368children	PA; bone mineral content and density	1. After adjustment for age and body size, accelerometry measures of PA and parental report of usual PA were consistently and positively associated with bone mineral content and bone mineral density.

(Wedderkopp et al., 2003)	Cross-sectional study in 481 children aged 8-10 and 325 adolescents aged 14-16	PA; back pain	1. There were no associations between self-reported PA and three pain variables (back pain, mid back pain and low back pain) 2. No obvious association between the objectively measured level of PA and back pain in children and adolescents.
(Cardon et al., 2004)	Cross-sectional study in 749 children (mean age 9.7)	PA; fitness; back and neck pain	1. Physical fitness levels were not associated with back pain reports, but pain reports were lower in girls reporting higher frequencies of moderate physical activity and better estimates for attitude toward physical activity. 2. Increased levels of physical activity contribute to better back health in girls.
(Novotny et al., 2004)	Cross-sectional study in 323 girls aged 9-14	PA; bone status	1. Increased overall PA was a significant predictor of both calcaneal broadband ultrasound attenuation and speed of sound
(Stager et al., 2004)	Cross-sectional study in 455 girls aged 12-18	PA; bone mineral density	1. A positive association was found between the time spent in metabolically intense activities and bone mineral density.
(Mikkelsson et al., 2006)	Longitudinal study over a period of 25 years on representative of Finnish adolescents aged 12-17 in baseline.	PA, fitness, tension neck, low back pain, knee injury	1. High adolescent flexibility predicted low occurrence of neck tension in men 2. High adolescent endurance strength predicted low occurrence of neck tension in women, but predicted knee injury in men. 3. Participation in leisure PA in adolescence predicted low occurrence of recurrent low back pain in men.
(Stager et al., 2006)	Cross-sectional study in 455 girls aged 12-18	PA; bone mineral density	1. No statically significant relationship was found between the overall PA scores and bone mineral density. 2. Activities with higher metabolic intensity were associated with a high bone mineral density.

PA: physical activity; CVD: cardiovascular disease CHD: cardiovascular heart disease; HDL-C: high-density lipoprotein cholesterol; LDL-C: low desity lipoprotein-cholesterol; TC: total cholesterol; TG: total triacylglycerol; GH: growth hormone; GHBP: growth hormone-binding protein; IGF-I: GH-insulin-like growth factor I

2.4.2 Physical activity and psychological health

Generally speaking, most studies report evidence that physical activity is psychologically beneficial for adolescents, including reducing mental health problems (stress, anxiety, and depression), enhancing good mental health (well-being, self-esteem, self-concept, and self-efficacy) and improving cognitive development (cognitive performance and academic achievement).

Byrne and Byrne (1993) reviewed studies involving the effect of exercise on depression, anxiety, and other mood status; they found the majority of studies supported both the anti-depressive properties of exercise and the effect of exercise in combating anxiety. In addition, the studies generally substantiate the claim that improved mood is associated with exercise.

When reviewing the literature, Calfas and Taylor (1994) pointed out that eight out of 11 studies addressing anxiety/stress variables found that physical activity was associated with a reduction in anxiety and stress. Nine out of 10 studies addressing self-esteem, self-concept, or self-efficacy found a positive relationship or experimental effect. Physical activity can contribute to improvements in self-concept and self-esteem. Of studies addressing depressed mood, nine out of 11 studies found decreases in depression. However, they noted that very little evidence was available for the association between physical activity and anger.

Mutrie et al. (1998) indicated that there is no evidence for negative mental health effects of physical activity or sports. In the 1990s', reviews also suggest that physical activity is associated with good mental health and low levels of mental problems in youth. In addition, some research had been devoted to establishing if those who engage in physical activity benefited intellectually or academically, with some available data appearing to support positive outcomes from physical activity on academic performance.

In another review of 54 studies published from 1970 to 1998, Sallis et al. (2000) concluded that achievement orientation, perceived competence, and intention to be

active had positive associations with physical activity in adolescents. Furthermore, depression was negatively correlated with adolescent physical activity. Following this review, Biddle et al. (2005) conducted a review of recent literature from 1999 to 2003 on the correlates of physical activity participation in adolescent girls. The findings revealed that physical activity showed a small-to-moderate association with self-efficacy and was consistently associated with more positive perceptions of self-body attractiveness and overall physical self-worth.

Tortolero et al. (2000) examined 48 articles published from 1983 to 1998, reaching a similar conclusion. They found physical activity and fitness had positive effects on self-perceptions and, in particular, these effects were most evident for self-concept, self-esteem, and self-efficacy. In addition, physical activity appeared to be associated with decreased depressive symptoms and improved perception of well-being.

Using meta-analytic techniques, Sibley et al. (2003) investigated the relationship between physical activity and cognition among youth. The results showed that physical activity had a positive association with cognition, concluding that physical activity might be related to improved cognitive performance and academic achievement.

Table 4 provides the details of research on psychological effects of physical activity among adolescents.

2.4.3 Physical activity and social behaviours

Table 4 also shows findings on the associations between physical activity and social behaviours among adolescents. Most studies suggested that physical activity helps to develop social and moral behaviours (e.g., decrease of anti-social behaviours, crime and violence). The more often adolescents participate in physical activity, the less likely they are to be substance users. For example, a very recent review showed that smoking was found to be related to lower levels of physical activity (Biddle et al., 2005). Trost et al. (2000) reviewed articles addressing associations between

participation in physical activity and other health behaviours among those 18 years and younger, concluding that active adolescents and athletes were less likely to smoke cigarettes than low-active adolescents and non-athletes. Moreover, the results suggested an inverse relationship between sport participation and illicit drug use. However, the relationship between physical activity and alcohol consumption or sexual activity was less clear.

Overall, the research evidence tended to support the view that involvement in properly guided physical activity and sports fosters the adoption of other healthy behaviours (Aarnio et al., 2002; Ferron et al., 1999; KirKcaldy et al., 2002; Kulig et al., 2003; Pate et al., 1996; Pate et al., 2000; World Health Organisation, 2003).

Table 4: Studies of the associations between physical activity and psychosocial health

Category	Authors	Participants and Study design	Measures	Main findings
Prevent mental illness				
Reviews	(Calfas et al., 1994)	Review (before1993) in 11-21 aged adolescents; 20studies	PA; anxiety/stress; depression; hostility/anger	1. 8 out of 11 studies addressing anxiety/stress showed that PA was associated with reductions in anxiety and stress. 2. 9 out of 11 studies addressing depressed mood found that PA was associated with decreases in depression. 3. Little evidence was available for hostility/anger and PA.
	(Mutrie et al., 1998)	Review (1976-1997) in children and adolescents; 20 studies (5 studies addressing PA and mental health problems)	PA; stress; anxiety; depression; psychiatric disorders	1. There were moderate effects for PA on anxiety and depression, although only 5 studies were included in the meta-analysis. 2. 2 experimental studies were hampered by high attrition rates but showed promising results. (more exercise less stress/depression)
	(Sallis et al., 2000)	Review (1970-1998) in children and adolescents; 54 studies among adolescents age 13-18.	Correlates of PA, such as biological, psychological, behavioural, social and cultural factors	1. Depression was the only psychological variable negatively correlated with adolescent physical activity.
	(Tortolero et al., 2000)	Review in children and adolescents aged 3-18 from 1983 to 1998; 48studies (30 studies examine mental illness)	PA/fitness; depression; anxiety; negative effect; sadness; loneliness; hostility	1. PA was associated with decreased depressive symptoms in both free-living and clinic populations. 2. PA was associated with decreased negative affect, decreased hopelessness and emotional distress, decreased loneliness.
Individual studies	(Ferron et al., 1999)	Cross-sectional study; a national representative sample of 10000 in school adolescents aged 15-20	PA; health behaviour and life style	1. Athletic adolescents had less somatic complains than non-athletic adolescents.
	(Crew et al. 2004)	Experimental study; children grade 4 (control, N=32; intervention, N=34); 6 weeks aerobic training	PA; depression; trait anxiety	1. The aerobic group reported significantly less depression. 2. No significant difference was found on trait anxiety.

Promote mental well-being				
Reviews	(Calfas et al., 1994)	Review (before 1993) in adolescents aged 11-21; 20studies	PA; self-esteem; self-concept; self-efficacy	1. 9 out of 10 studies addressing self-esteem/concept/ efficacy found a positive relationship with PA.
	(Mutrie et al., 1998)	Review (1976-1997) in children and adolescents; 20 studies (7 studies addressing PA and good mental health)	PA; mood; well-being; self-esteem	1. A consistent positive relationship between PA and well-being 2. There is no evidence of negative mental health effects of PA or sport.
	(Tortolero et al., 2000)	Review in children and adolescents aged 3-18 from 1983 to 1998; 48studies (20 studies examine self-perception)	PA/fitness; self perception	1. PA and fitness had positive effects on self-perceptions and these effects were most evident for self-concept, self-esteem and self-efficacy. 2. Data were limited about the effects of PA on body image.
	(Ekeland et al., 2004)	Review with 1821 children and young people aged 3-20; 25studies (23 trials)	Exercise; self-esteem	1. Exercise showed positive short-term effects on self-esteem among youth aged 3 to 20.
	(Biddle et al., 2005)	Review (1999-2003) in adolescent girls aged 10-18 with a total of 50 studies.	Correlates of PA, such as biological, psychological, behavioural, social and cultural factors	1. PA was associated with perceived competence in 4 of 5 studies, with most effects being small. 2. PA showed a small-to-moderate association with self-efficacy. 3. PA was associated with more positive perceptions of one's body attractiveness and overall physical self-worth. 4. PA showed a small-to-moderate positive association with concerns and importance expressed about body weight and appearance in 3 of 4 studies.
Individual studies	(Ferron et al., 1999)	Cross-sectional study; a nationally representative sample of 10000 school adolescents aged 15-20	PA; health behaviour and life style	1. Athletic adolescents had more confidence in their future health and a better body image than non-athletic adolescents

	(Keats et al., 1999)	Longitudinal study in 53 adolescents with cancer (during three time periods: prediagnosis, treatment and posttreatment)	PA; depression; self-concept	1. The organised sport pattern had implications for the current psychosocial well-being of adolescents after cancer diagnosis. 2. Those who maintained their organized sport participation across the cancer experience reported better general self-concept, physical abilities, parental relations, same sex relations and opposite sex relations.
	(Colchico et al., 2000)	Experimental study in adolescent girls aged 11-14 (12 weeks; intervention, N=30; no control group)	PA; well-being	1. Participation in physical activity enhanced scores on 4 of 5 self-perception subscales and in global self-worth.
	(Crew et al. 2004)	Experimental study; children grade 4 (control, N=32; intervention, N=34); 6 weeks aerobic training	PA; self-esteem	1. The aerobic group reported greater self-esteem.
	(Rodriguez & Audrain-McGovern, 2005)	Cross-sectional study in 983 high school adolescents	PA, Global physical self-concept, smoking	1. PA had a significant effect on global physical self-concept for both boys and girls.
Enhance academic achievement				
Reviews	(Calfas et al., 1994)	Review (before 1993) in adolescents aged 11-21; 20studies	PA; academic performance	1. Evidence regarding academic achievement was sparse. 2. One study showed no effects on academic performance, while another study found that a one-hour increase in PA per day improved math performance.
	(Mutrie et al., 1998)	Review (1976-1997) in children and adolescents; 10 studies	PA; academic performance	1. 1 study showed that running had a positive effect on creativity, which could be considered a cognitive process. 2. 3 quasi-experimental designed studies found that daily physical education had no beneficial effects on academic performance.

	(Tortolero et al., 2000)	Review in children and adolescents aged 3-18 from 1983 to 1998; 48studies (14 studies examine academic achievement, creativity, and perceived health/well-being)	PA/fitness; academic achievement	1. 2 out of 3 experimental studies reported no differences between groups in academic performance. 2. 2 out of 3 studies showed that PA reduced levels of confused thinking and improved concentration levels. 3. 3 out of 3 studies found a significant association between PA and perceive well-being.
Develop social and moral behaviours				
Reviews	(Mutrie et al., 1998)	Review (1976-1997) in children and adolescents; 20 studies (8 studies addressing PA and delinquent behaviour)	PA; delinquent behaviour	1. No meta-analytic reviews were located on this topic. 2. 3 out of 4 correlation studies showed that sport participation had a negative association with delinquency. In contrast, a longitudinal cohort study found opposite results.
	(Sallis et al., 2000)	Review (1970-1998) in children and adolescents; 54 studies among adolescents age 13-18.	Correlates of PA, such as biological, psychological, behavioural, social and cultural factors	1. Achievement orientation, perceived competence, and intention to be active showed positive associations with physical activity. 2. Alcohol use and healthy diet was unrelated to PA. 3. The relationship between PA and smoking was indeterminate. 4. Sedentary behaviour after school and on weekends was inversely related to PA.
	(Tortolero et al., 2000)	Review in children and adolescents aged 3-18 from 1983 to 1998; 48studies (30 studies examine risk behaviour)	PA/fitness; risk behaviour	1. Children and adolescents who participated in PA were less likely to use tobacco, marijuana and cocaine.

	(Trost et al., 2000)	Review in children and adolescents under 18 years	PA; sport; health behaviour	1. Athletes were about 1.2 to 4times less likely than non-athletes to smoke cigarettes. 2. Active adolescents were about 1.4 to 5 times less likely to smoke cigarette than their low-active counterparts. 3. Findings on the relationship between sport/PA and alcohol consumption were inconsistent. 4. An inverse relationship was found between sport and illicit drug use. 5. A positive association between PA and healthy dietary practices was reported. 6. Participation in sports emphasizing leanness and artistic ability was associated with an increased risk for inappropriate weight control methods and eating disorders, especially among female athletes. 7. Sport participation was not related to violent behaviour in adolescents.
	(Biddle et al., 2005)	Review (1999-2003) in adolescent girls aged 10-18 with a total of 50 studies.	Correlates of PA, such as biological, psychological, behavioural, social and cultural factors	1. Lower levels of PA were related to smoking.
Individual studies	(Ferron et al., 1999)	Cross-sectional study; a national representative sample of 10000 in school adolescents aged 15-20	PA; health behaviour and life style	1. Athletic adolescents had a lesser tendency to attempt suicide and a lower use of tobacco, wine and marijuana than non-athletic adolescents. 2. Logistic regression analyses showed no evidence of a link between the frequency of sports and being sexually active.
	(Rodriguez et al., 2005)	Cross-sectional study in 983 high school adolescents	PA, Global physical self-concept, smoking	1. A significant indirect effect for PA on smoking, through its effects on global physical self-concept. Global physical self-concept mediated the relationship between PA and smoking (PA had a significant effect on global physical self-concept; further, global physical self-concept had a significant negative effect on smoking).

2.4.4 Negative effects of physical activity

In addition to the long-term health benefits of physical activity, concern has been expressed regarding the potentially negative effects of physical activity.

First of all, vigorous physical activity may cause acute or stress injuries to the developing musculoskeletal system during adolescence (Kujala et al., 1999). Excessive amounts of physical activity can lead to injuries, menstrual abnormalities, and bone weakening (Department of Health and Human Services, 1996). Some studies suggested that physical activity was not associated with back pain (Cardon et al., 2004; Wedderkopp et al., 2003), whereas significant relationships were observed between physical activity and various pain symptoms among adolescents in another study (Kujala et al., 1999). Kujala et al. (1999) reported that musculoskeletal pains (in particular low back pain, upper limb pain, and lower limb pain) were found more often in subjects participating in large amounts of leisure physical activity, while non-musculoskeletal pains (in particular headache among boys) tended to be less common. They noted that vigorous physical activity is related to musculoskeletal pains during adolescence and suggested that it should be considered when tailoring health promotion programmes to adolescents. In addition, some activities and sports might increase the risk of accidents, including road accidents, falls collisions and other trauma (Biddle et al., 1998).

Another potential negative outcome of physical activity might lead to eating disorders for adolescents. However, researchers suggested that there was insufficient evidence to reach this conclusion since the relationship between physical activity and body image has not been well studied (Calfas et al., 1994). (Some research relating to body image and physical activity will be reviewed in the next section).

Section summary

In general, there are few experimental studies in this area and some relationships are weak, especially for physical health. In addition, many studies may have

methodological design weaknesses, including small sample size (Colchico et al., 2000), lack of random assignment (Jamner et al., 2004), and no control group (Colchico et al., 2000). These limitations make it difficult to offer definitive conclusions. Compared to adults, children are inherently healthy, even in the face of a sedentary lifestyle. It may be that the majority of lifestyle-related chronic diseases have had insufficient time to become apparent (Riddoch, 1998). Nevertheless, the majority of evidence seems to show a positive association between physical activity and health among adolescents. Furthermore, adolescence might be the time at which the roots for developing preference for physical activity or inactivity become more firmly established (Thompson et al., 2003). Therefore, these ideas would suggest that there is a need to increase physical activity in the young population, since appropriate regular physical activity provides young people with substantial physical, mental, and social health gains and helps maintain optimal health and functional capacity throughout the life (World Health Organisation, 2003).

To sum up, regular physical activity helps adolescents to build healthy bone, control body weight, and develop efficient function of the heart in order to limit the evolution of health risk factors for minimising future disease. Furthermore, engagement in physical activity also gives young people opportunities for decreasing depression, relief of tension, and enhancement of academic performance. Last but not least, participating in physical activity regularly may establish a healthy lifestyle during adolescence, which might be continued into adulthood.

2.5 Body image, obesity and physical activity

2.5.1 Body image and 'desired' body weight

Previous research illustrated that more than half of adolescents are dissatisfied with their body and desired to lose weight (Levine et al., 2002; Rinderknecht et al., 2002; Shih et al., 2002). However, there is an increasing prevalence of obesity in young people worldwide as seen in European, American, or Asian countries (Lobstein et al., 2004; Savva et al., 2002; UK Department of Health, 2003, 2004). This trend toward over-fatness is paralleled by a cultural increase in body focus (Page et al., 1997) since there is considerable emphasis placed on body weight, size, and appearance. In general, being thin is highly valued within our society and being fat is associated with negative characteristics for girls (Grogan, 1999; McCabe et al., 2003; Ricciardelli et al., 2001a). These stereotypes are reinforced by the media, family and friends. Therefore, individuals feel heightened anxiety and pressure to achieve the slender physique. The media's portrayal of what is the 'ideal body figure' is thin for women. Nevertheless, the prevalence of obesity is increasing, which exaggerates the discrepancy between the 'ideal' and 'actual' body and may increase the prevalence of body dissatisfaction. A Japanese study illustrated that 20% of the women aged 15-39 years considered their body shape as 'obese', even though the actual overweight prevalence was only around 10%. The gaps between 'desired' and 'actual' body weight were extremely large among female participants aged 15-19 (Figure 13) (Yoshiike et al., 2002).

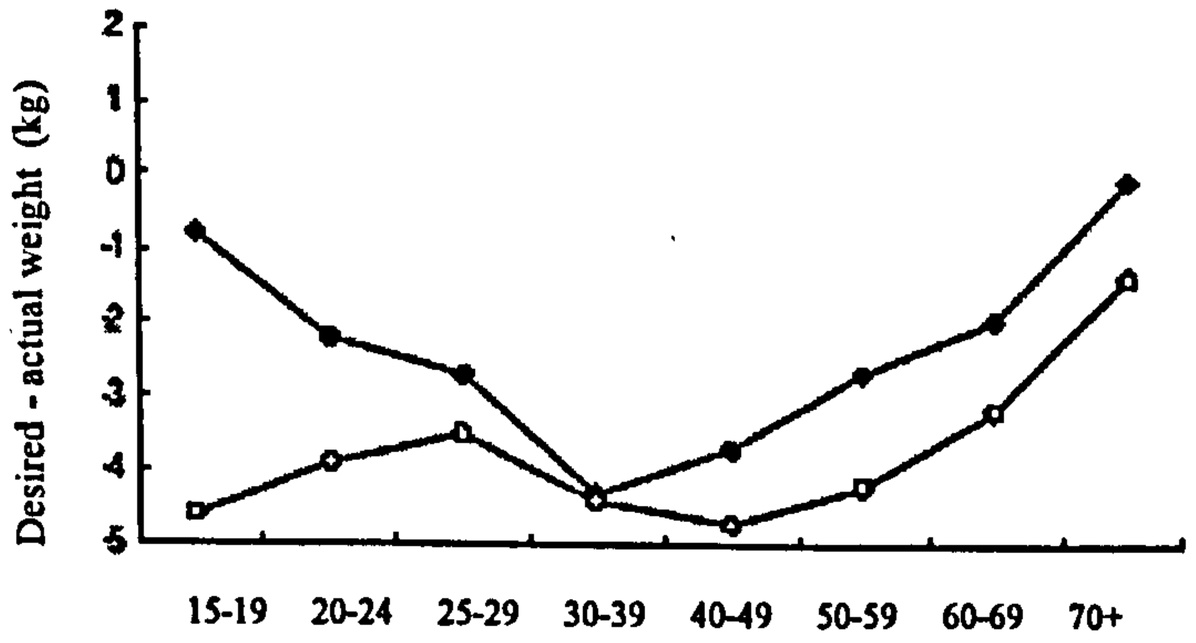

Figure 13: The gaps between 'desired' and 'actual' body weight
(♦) Male; (O) female; Source: (Yoshiike et al., 2002)

2.5.2 Body image and physical activity

Body image as a motive for engaging in physical activity (weight loss)

Bruch (1980) pointed out that the obsession of the society with slimness and the condemnation of obesity as undesirable might be considered a distortion of the social body concept, but it dominates present day living. In desperate attempts to achieve the 'ideal' body shape, many adolescent girls adopt a range of behaviours or activities for weight loss practice. One of the benefits of physical activity is its consistent association with the maintenance of weight loss (Goldberg, 1997). A review paper found that studies consistently showed exercise is a significant determinant of long-term weight maintenance (Pronk & Wing, 1994). For the great majority of individuals who engage in physical activities, the goal is some type of health maintenance or enhancement, recreational outlet, or accomplishment of a certain appearance (Thompson, 1990). However, many people engage in regular physical exercise as a means of body-image management—to reshape body physique, enhance body appearance or to lose weight (Cash et al., 1994; Moore, 1993; Thompson, 1990; Williams & Cash, 2001).

Research illustrated that high-level female exercisers reported greater body satisfaction and had significantly lower percentage body fat than a low-level group (Davis & Fox, 1993). Consequently, an increasing number of women engaging in physical activity for reasons related to body image has occurred (Berardi, 2003). Appearance/weight management was significantly correlated with reported engaging in physical activity in adolescent girls and women (Berardi, 2003; Davis, 1997a). McCabe et al. (2002) indicated that physical activity is an important strategy that is used among adolescents in modifying weight levels to move to the ideal body. For example, 59.3% of American adolescent girls tried to lose weight and 65.7% of them had exercised to lose weight or to keep from gaining weight (Department of Health and Human Services Centers for Disease Control and Prevention, 2004). McConnell (1998) also found that body dissatisfaction and a large weight loss expectation due to physical activity were related to engaging in high levels of physical activity for adolescent girls.

Baker and Brownell (2000) reported that exercise results in physical changes in body shape, which might lead to improvements in individuals' self-image and confidence. These positive changes in body image may help prevent eating disorders for individuals with poor body image. A study showed that participants reported significant improvements in their evaluations of their physical appearance and in their body satisfaction after a 6-week circuit weight-training program (Williams et al., 2001). Thus, improvements in body image that are attributed to exercise may be reinforcing and lead to greater long-term exercise adherence, as well as increased confidence in one's ability to make positive changes related to body shape or weight (Baker et al., 2000).

Body image as a barrier for physical activity participation

A desire to lose weight has become a widespread motivation to engaging in physical activity for adolescent girls (Berardi, 2003; Rice, 1996). The high prevalence of body dissatisfaction coupled with the preferential use of physical activity to achieve a subjective 'ideal' image would suggest that adolescent girls would choose to engage in high levels of physical activity (McConnell, 1998). However, the prevalence of physical activity has been found to decline with increasing age during adolescence.

Negative body image can be a barrier to exercise for overweight/obese individuals. When exercising in public places, they may be concerned about other people's impressions of them when they are exercising (Baker et al., 2000; Goldberg, 1997). For example, one study showed BMI was positively correlated with weight teasing during physical activity and the authors found that overweight children commonly reported 'being embarrassed doing physical activity and playing sports' (Faith et al., 2003). Therefore, negative body image might deter obese individuals from exercising in public settings (Chenskin & Donze, 2001).

In addition, doing physical activity might lead individuals to focus exaggerated attention on their body, which might enhance dieting and weight concerns. A randomised controlled study revealed that female undergraduates in the intervention showed a significant increase in drive for thinness without any changes in body

dissatisfaction. The results suggest that physical activity interventions may have some negative consequences by increasing concerns about thinness in women (Zabinski et al., 2001).

Section summary

All in all, the increasing prevalence of obesity and the idealisation of slenderness might increase body dissatisfaction and may lead to the vogue for achieving an ideal body figure for adolescent girls. When girls do not fit the slender beauty standard, many of them engage in physical activity owing to the expectation of modifying weight levels.

However, the association between body image and physical activity is complicated. As Davis (1997a) suggested, it may be influenced by many factors including individual differences in personality characteristics and motivation. Engaging in physical activity might reduce body weight and enhance individuals' perceived body image at the onset. On the other hand, physical activity participation might also increase body dissatisfaction in the presence of certain conditions. Individuals might compare with the ultra-slender models featured in exercise videos and magazines, which may shift their idealised body image toward a thinner standard. Thus, the resultant dissatisfaction may remain the same regardless of objective improvement. In addition, failure to establish appropriate expectations may ultimately influence one's belief regarding the effectiveness of physical activity and subsequently serve to reduce physical activity participation (McConnell, 1998).

Another factor is cultural difference when considering the relationships between body image and engaging in physical activity. Societies sometimes place constraints on women's participation, women frequently being more limited than men in terms of activities and situations it is socially acceptable to be in (Goldberg, 1997). For instance, in Chinese culture, women were frequently encouraged to stay indoors (except in the Tang dynasty) and the footbinding custom limited this participation in

activities. In addition, the Chinese regarded the image of frailty as beautiful and feminine (Hesse-Biber, 1996). Even in contemporary Chinese society, 10% of women are isolated in terms of physical activity due to the dislike of physical activities (exercise or sports) and 7% of women viewed that engaging in physical activity contravened the tradition values. Almost one in four (24%) of women held the view that 'a woman's beauty lies in her weakness', which prevented them from engaging in physical activity (China General Administration of Sport, 1998). Results in a cross-cultural study showed that Chinese female students spent significantly less time in physical activity than American female students. Weight management was the primary motive for American female students. However, social interaction was the primary motive for Chinese female students (Chen, 1998). The findings suggested that the motives for physical activity participation and the strategies for weight loss might differ from cultures. Therefore, it is important to understand the relationship among body image, obesity and physical activity within a socio-cultural context.

CHAPTER 3 Research design

3.1 Overview of research design

The purposes of this research were to (1) examine the prevalence of obesity, (2) understand physical activity behaviour, (3) investigate the prevalence and the relevant factors of body dissatisfaction, and (4) explore the relationships between obesity, physical activity, and body image in Taiwanese adolescents.

Following a review of the relevant literature in Chapter 2, it was found that there is an increased interest in the topics on body image issues and obesity problems in children and adolescents, especially in western countries. However, female body image information in Asian women is scarce; few studies have focused on the association between body image and physical activity; and so little research has actually been conducted on the relationships between obesity, physical activity, and body image. What remain to be explored are the current prevalence of obesity, physical activity and body dissatisfaction among Taiwanese adolescents; what are the factors relevant to body dissatisfaction; how the culture acts on the ideal body image; and how adolescents cope with these ideal images.

In order to gain insights into these issues, the present research adopts a sequential mixed methods design with both quantitative and qualitative approaches. Four studies were conducted in three phases using three techniques, including secondary data analysis, questionnaire survey, and interview.

The overall research design is formalized in Table 5. Phase one (secondary data analysis) and two (questionnaire survey) are quantitative studies looking at the prevalence and statistical relationships in obesity, physical activity, and body dissatisfaction. Following these analyses, phase three (interview) looks within a small group, using qualitative methods to better understand the reasons or meanings in the previous findings and to explore more about the attitudes towards obesity, physical activity and body image.

Phase one (study 1 and 2) takes a quantitative approach based on secondary data analyses to evaluate the prevalence of obesity and physical activity among Taiwanese adolescents. Both studies are cross-sectional and have nationally representative samples. Study 1 describes the prevalence and temporal changes of obesity and the relationships with fitness and health with measured weight and height. Study 2 examines the prevalence of physical activity and how socio-demographic variables and health-related behaviours might relate to physical activity engagement. Phase two (study 3) examines the prevalence of body dissatisfaction and identifies the relevant factors of body dissatisfaction with a self-completion questionnaire. Following this, a qualitative study (Phase three: study 4) is carried out by exploring aspects of body image concerns in relation to obesity and physical activity to provide some explanation for the findings in previous studies.

In sum, in an effort to shed light on the issues of obesity, body image, and physical activity among Taiwanese adolescents, this research examines the prevalence of obesity and physical activity using secondary data. Then, a questionnaire survey is conducted to investigate the body image concerns. Based on these results, interviews of a small sample are used to further explore the adolescent attitudes toward obesity, body mage, and physical activity.

Table 5: Overview of the three-phase sequential mixed methods design

Phase	Study	Approach / Method	Objectives	Data collection
I	1	**Quantitative** / Secondary data analysis	1.Examine the prevalence of childhood and adolescent obesity in Taiwan. 2.Investigate the association between obesity and physical fitness and health.	(1)Source:'1999 and 2001 National Physical Fitness Norm Survey' conducted by Taiwan National Council on Physical Fitness and Sports (2)Nationally representative sample: N= 13,935 in 1999 and 24,586 in 2001 (3)Sample age: 6 – 18 (4)Measures: measured weight and height, blood pressure, and health related fitness tests (bent-leg curl-ups, sit-and-reach, and step test)
	2	**Quantitative** / Secondary data analysis	1.Assess the prevalence of physical activity in Taiwanese adolescents. 2. Examine the associated socio-demographic and behavioural variables with physical activity	(1)Source:'2001 National Health Interview Survey' conducted by Taiwan Department of Health (2)Nationally representative sample: N=2,235 (3)Sample age: 12-18 (4)Measures: self-reported weight and height, physical activity, sedentary behaviour, weight control behaviour, and risky behaviours (smoking, drinking and drug use)
II	3	**Quantitative** / Questionnaire survey	1.Assess body dissatisfaction among Taiwanese adolescents. 2.Investigate the factors relevant to body dissatisfaction. 3.Serve as a means of identifying appropriate candidates for the follow-up interview	(1)Pilot study: N=33; age 12-13 (2)Test-retest: N= 43; age 12-13 (3)Sample: selected by multiple-stage sampling in the order of urbanisation, school, and class in Taipei County. A total of 30 classes in 5 schools were selected resulting in 883 participants aged 12-16 (response rate: 73.1%). Questionnaire survey was conducted in Taipei County in 2005. (4)Measures: self-reported weight and height, physical activity, weight control behaviour, self-esteem, perfectionism, body image, and awareness and internalisation of the thin ideal.
III	4	**Qualitative** / Interview	1.Gain insight into the overweight/obese girls' views toward physical activity. 2.Explore how they feel about their own body. 3.Capture their images of ideal female body and how they cope with these ideals. 4.Delineate the links between body image concerns and physical activity	(1)Interview practice: 2 interviews were conducted in the UK (2)Pilot study: 2 interviews were carried out in Taiwan (3)Sample in main study: A total of 13 overweight/obese girls aged 12-16 were interviewed from 4 schools in 2006 based on participants' willingness to be interviewed in study 3. Four normal weight girls were also interviewed, but served as a pilot study as well due to a focus on obesity in this study. (4)Measures: interview guide includes 4 parts: my physical activity, my body and my self, my body and others, and ideal body and society.

3.2 Rationales for use of mixed methods

The mixed methods approach has received extensive interests (Creswell, 2003; Creswell et al., 2003; Greene et al., 1989; Steckler et al., 1992; Tashakkori & Teddlie, 2003; Teddlie & Tashakkori, 2003). Researchers have postulated that the weaknesses in both quantitative and qualitative methods might be compensated for by the strengths of the other by using mixed methods (Steckler et al., 1992; Teddlie et al., 2003).

Quantitative methods produce factual, reliable outcome data with a macro level that are usually generalizable to some large population. However, the measurement process possesses an artificial and spurious sense of precision and accuracy (with fixed-choice answers). The advantages of qualitative methods are that they generate rich, deep, detailed, and valid process data with a micro level. The potential pitfalls are that qualitative research is too subjective and difficult to replicate (Bryman, 2001; Creswell, 2003; Steckler et al., 1992).

Social phenomena (e.g., human behaviour and attitudes) cannot be fully understood using either purely quantitative or qualitative techniques. A mixed methods design might be one in which a need exists to both understand the relationship among variables in a situation and explore the topic in further depth (Creswell, 2003). It provides a variety of data sources and analyses to better understand the multifaceted institutions or realities (Patton, 1990; Teddlie et al., 2003). In addition, after reviewing 57 mixed methods studies, Greene et al. (1989) identified five purposes for using the mixed methods: (1) Triangulation: seeking the convergence of results; (2) Complementarily: examining overlapping or different facets of a single phenomenon; (3) Development: using the methods sequentially; (4) Initiation: discovering paradoxes and contradictions; (5) Expansion: mixing methods to extend the scope, breadth and range. The first two purposes are related to the fact that mixed methods lead to multiple inferences that confirm or complement each other. The other three purposes are more related to mixed methods studies where inferences made at the end of one phase lead to the design of a second phased (Teddlie et al., 2003).

Therefore, this research draws on the strengths of both quantitative and qualitative approaches in three phases (four studies) according to the aims of the present research. It begins with a quantitative approach where the prevalence and relationships are examined, to be followed by a qualitative method involving detailed exploration with a few individuals.

The quantitative secondary data with nationally representative samples are analysed first. These provide more reliable information on obesity problems and physical activity behaviours among Taiwanese adolescents. In the second phase, a quantitative questionnaire survey is conducted investigating the prevalence and relevant factors of body dissatisfaction. Then through the third phase, qualitative interviews explore the understanding of specific factors (obesity and physical activity) in relation to body image within a small sample.

The need to examine the prevalence of obesity, physical activity, and body dissatisfaction and the relationships among them lead to a priority for the quantitative approach. Then, the research is followed to explore more understandings of the relationships. The sequence and priority was 'sequential **Quantitative**→Qualitative design', which is shown in Figure 14. Figure 15 outlines a diagrammatic representation of the chronology of the phases, methods, studies and data collection process.

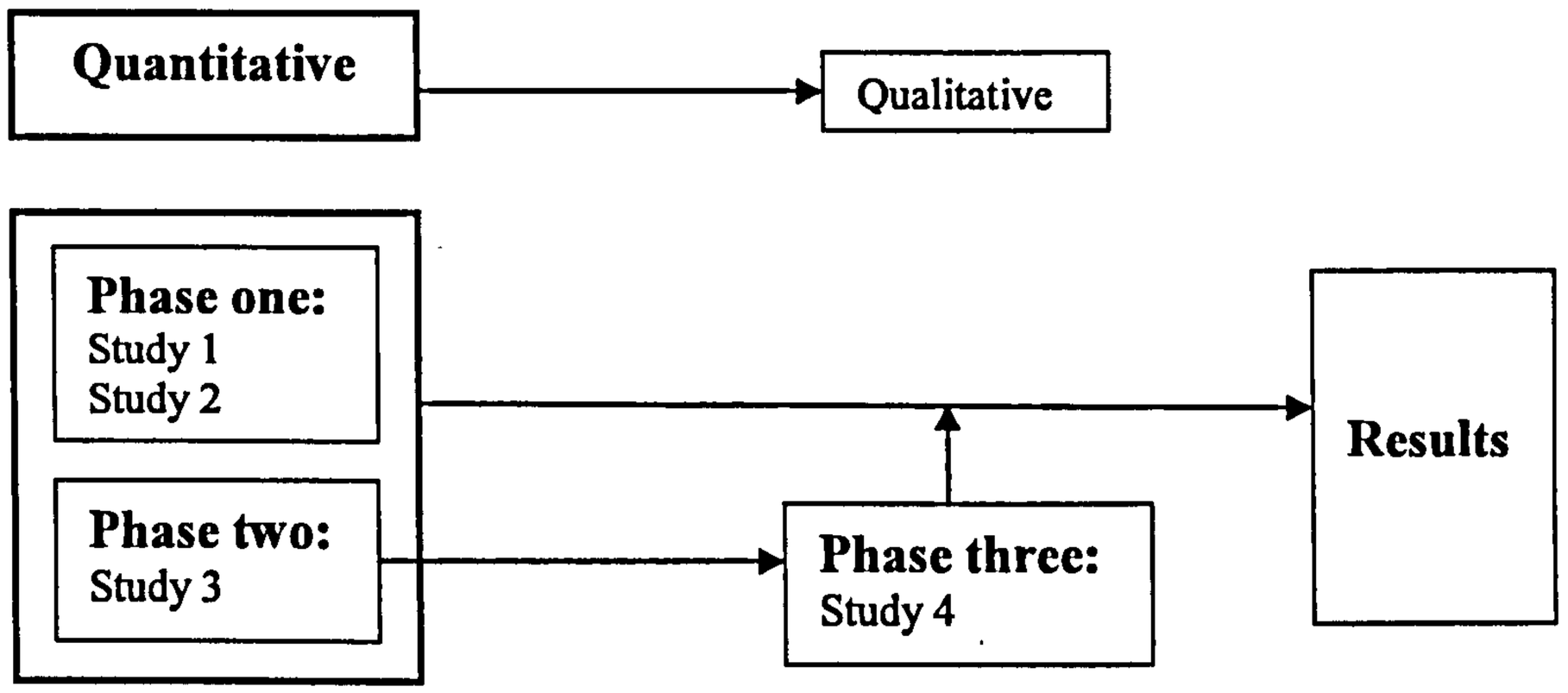

Figure 14: Sequential three-phase research design
Source: adapted from (Creswell, 2003; Creswell et al., 2003; Steckler et al., 1992; Tashakkori & Teddlie, 1998)

Phase one: Secondary data analysis

Study 1: Prevalence of obesity
Applying data
Data analysis
Writing-up
Paper submission for journal publication (published)

Study 2: Prevalence of physical activity
Applying data
Data analysis
Writing-up
Paper submission for journal publication (in press)

May 2004 – August 2005

Phase two: Questionnaire survey

Study 3: Body dissatisfaction
Recruitment (meeting with school head teachers)
Questionnaire developed & translated & revised
Apply Ethical Approval
Pilot study
Questionnaire conduction
Questionnaire returned
Data processing
Data analysis
Writing-up

August 2005 –February 2006

Phase three: Interview

Study 4: Obesity, body image and physical activity
Design interview guide
Interview practice and pilot study
Interview conduction
Data transcripts and analysis
Writing-up

February 2006 – September 2006

Figure 15: Chronology of the data collection process

3.3 Ethical consideration

The ethics application was the same for both study 3 (Chapter 6) and study 4 (Chapter 7). The application was approved by the Department of Exercise and Health Sciences Research Ethics Committee on 20th November 2005 (reference number 05/045) (appendix 1).

CHAPTER 4 Study 1: Obesity, fitness and health in Taiwanese children and adolescents

4.1 Introduction

The WHO (2000) has reported that obesity represents a growing threat to the health of populations in both developing and developed countries, affecting children and adults alike. The prevalence of childhood obesity is rising rapidly and has already raised concern in Europe, North and South America, and more recently in the Pacific Rim countries (Department of Health and Human Service, 2001; International Obesity Task Force, 2002; Lobstein et al., 2004; UK Department of Health, 2003).

From the reviewed literature in Chapter 2, the findings indicate that during early years, obesity is associated with risk factors for ill-health and adverse physical and psychosocial consequences (Loke, 2002; Wabitsch, 2000a, 2000b). For example, obese children and adolescents have higher systolic blood pressure and less healthy lipid profiles, as well as increased stress on weight bearing joints (Chu, 2001; Dietz, 1998; Loke, 2002). In addition, obese children are more likely to suffer from psychological problems such as poor self-image and low self-esteem (Dietz, 1998; Edmunds et al., 2001). The long term effects of obesity are that obese children are more likely to become obese adults (Serdula et al., 1993), and are at increased risk of metabolic syndrome and other disorders accompanying obesity (Must et al., 1999; Vanhala et al., 1998). Hence, it is vital to understand and monitor obesity prevalence and its changes in order to combat the continuing rise among youth and adults.

Data on the prevalence and correlates of childhood obesity are available in many countries, especially in Europe and North America (Livingstone, 2000; Lobstein et al., 2004; Lobstein & Frelut, 2003; North American Association for The Study of Obesity, 2003). Obesity in Asian countries has only recently received substantial attention. In Korea, the first standardized epidemiological survey regarding obesity prevalence was not conducted until 1995 (Kim et al., 2005). However, several other Asian

countries such as Japan have reported increases in childhood obesity (Lobstein et al., 2004; Matsushita et al., 2004).

Although 243 published studies have been identified in the last decade investigating obesity issues with Taiwanese populations (Taiwan National Central Library), only 11 of these studies focused on obesity prevalence and patterns in children and adolescents (Chen et al., 1993; Chu, 2001, 2004; Fu et al., 2004; Huang & Wu, 2000; Huang et al., 2003; Lee & Lee, 1997; Lee et al., 1994; Lee, 1995; Lin et al., 1998; Yu, 1999). Seven of these studies were published in the Chinese language, and none of them used a nationally representative sample. Furthermore, the prevalence figures for obesity in children in Taiwan are still unclear as several definitions of obesity have been used (Lee, 1995; Taiwan National Institute for the Health Research, 2001; Yu, 1999). For example, two studies have reported data from large samples of schoolchildren but have focused on weight for height data (Huang et al., 2000; Huang et al., 2003). Other studies have used 85th and 95th body mass index percentiles for age or weight greater than 120% ideal-body-weight (Lee et al., 1994; Lee, 1995; Lin et al., 1998). Two recent papers reviewed the literature for childhood obesity in Taiwan (Chu, 2005; Lagerros et al., 2004). One focused on the factors associated with childhood obesity and prevention strategies (Lagerros et al., 2004). The other addressed the prevalence and trend of obesity in Taiwan from 1980 to 1996 where obesity was defined as > 120% of mean body weight (Chu, 2005). Therefore, there are no studies featuring recent nationally representative samples of children and adolescents that have used the now widely accepted and internationally founded body mass index criteria developed for the International Obesity Task Force (IOTF) by Cole et al. (2000). The main advantages of these criteria are that they are derived from adult values associated with health risk and also allow international comparisons.

Little is known about the relationship between different elements of physical fitness and overweight or obesity in Taiwanese children and adolescents. For example, whether lack of hip flexion flexibility, muscular endurance of the abdominal muscles, or aerobic fitness, which are associated with poor physical function and health in adults, are related to degree of overweight in this population. Similarly, there are few

data on the interaction between cardiovascular fitness and related indicators of ill health such as higher than normal blood pressure in children who are obese. Obesity when carried into adulthood is associated with increased risk of developing cardiovascular disease and other health problems (Dietz, 1998; Must et al., 1999). Furthermore, higher levels of physical fitness and physical activity are, independently of weight and other key factors, associated with reduced risk of cardiovascular disease, diabetes and all-cause mortality in adults (Blair et al., 1996; Blair et al., 1989; Lee et al., 1999). It is possible, that a similar relationship exists in children and adolescents but this has yet to be fully explored.

The National Physical Fitness Survey, conducted by the National Council on Physical Fitness and Sports in Taiwan in 1999 and repeated in 2001 provides an opportunity to study the prevalence of overweight and obesity in nationally representative samples of 6-18 year olds. Measured height and weight are available alongside measures of components of physical fitness and blood pressure. This offers a unique opportunity to study the interrelationships between weight status, elements of physical fitness and hypertension as early indicators of ill-health. The specific purposes of this study were therefore to 1) determine the prevalence of childhood and adolescent obesity in Taiwan, showing the development of the obesity prevalence from 1999 to 2001 and offering international comparisons; 2) examine the relation between obesity/cardiovascular fitness and blood pressure; and 3) compare fitness levels between overweight/obese and normal weight adolescents in Taiwan.

4.2 Methods

4.2.1 Sample

The National Physical Fitness Survey was conducted by the National Council on Physical Fitness and Sports in Taiwan in 1999 and repeated in 2001. A stratification random method was used to select the sample based on the resident population in Taiwan. In the first sampling phase, Taiwan was divided into 25 district regions (18

counties and 7 cities). After stratification, the sample size was selected according to the proportion of the population by gender and age in each district region.

A total of 20,686 individuals aged 6-65 were available in the 1999 National Physical Fitness Survey and 42,412 in the 2001 National Physical Fitness Survey. For this study, only those aged 6 to 18 years (inclusive) of age were included. In the 1999 survey, participants were 13,935, of whom 7,031 were boys and 6,904 were girls. A total of 24,586 individuals were involved in the 2001 survey, including 12,367 boys and 12,219 girls. For the purposes of this study, respondents were categorised by age into children (age 6-11), early adolescents (age 12-14) and late adolescents (age 15-18).

4.2.2 Measures

The National Physical Fitness Survey was a health-related physical fitness survey used to establish the norms of physical fitness for people aged 6-65. Measures were taken by assistants who had attended a regional training seminar and passed a certification test on standardised procedures. Inspectors from the National Council on Physical Fitness and Sports and universities visited each site to supervise progress. The survey included four measures (Taiwan National Council on Physical Fitness and Sports, 1999, 2001):

Weight and height were obtained using a stadiometer and digital or balance beam scale. All instruments had been verified and approved by the Taiwan Bureau of Standards, Metrology and Inspection. Participants wore light clothes without shoes.

Systolic and diastolic blood pressures were measured using a cuff sphygmomanometer at the right arm before all fitness tests. Data for children and adolescents was available in the 2001 survey only. Participants were classified in the "hypertension" group if their systolic pressure was ≥140 and/or diastolic pressure ≥ 90 and all others were classed as the "normal" group (Burke et al., 2004; World Health Organization, 2003a).

Several tests were used to assess the main components of health-related fitness:

(i) The number of bent-leg curl-ups attained in 1min was used to test abdominal muscle strength and endurance (Chen et al., 2002; Huang & Malina, 2002).

(ii) The standardised sit-and-reach test was used to measure the lower back and hip joint flexibility (American College of Sports Medicine, 2003; Chen et al., 2002; Huang et al., 2002; Ozdirenc et al., 2005).

(iii) A 3-minute step test was used to assess cardiovascular endurance. This involved participants stepping at a rate of 24 steps/min onto a 35cm high bench. A cardiovascular index (CI) was obtained by the following formula:

$\mathrm{CI} = \frac{Time \times 100}{(\sum pulse) \times 2}$ where *Time* is the duration of exercise period in seconds and $\sum pulse$ is the sum of 3 half-minute pulse counts (1-11/2, 2-21/2, 3-31/2 minutes) during recovery (Bosco & Gustafson, 1983; Heyward, 1991).

After the tests, participants were given the results and advice from professional instructors, and also received mementos.

4.2.3 Definition of overweight and obesity

BMI is the key overweight and obesity measure in this study, which was calculated as weight in kilograms divided by the square of height in meters (kg/m^2) using measured weight and height. Although there is no generally agreed criterion for classifying obesity in children and adolescents, one widely favored indicator is the IOTF criteria. The IOTF criteria were derived centile curves that passed through the health-related adult BMI cutoffs (25 kg/m^2 and 30 kg/m^2) at 18 years using data from six countries (Great Britain, Brazil, the Netherlands, Hong Kong, Singapore and the USA). These age- and sex-specific cutoff points were applied to classify overweight and obesity for BMI groups (Cole et al., 2000).

4.2.4 Statistical analysis

All the statistical analyses were carried out using the SPSS 12.0 statistical package. Very few missing data were found in the weight, height and fitness measures (range from 0%-0.56% of the sample). The potential outliers were also examined with cases having standardized scores in excess of 3.29 but the incidence of outliers was not greater than 0.8% for any variable (Tabachnick & Fidell, 2001)(Field, 2005).

Descriptive statistics for age, gender, weight, height, and BMI were calculated to characterise the respondents. Differences in the prevalence of overweight and obesity in 1999 and 2001 were assessed using cross tabulation by age group and gender. As low obesity prevalence was consistently found (particularly in girls), both the overweight and obesity figures were combined and subsequently referred to as 'overweight/obesity prevalence'.

Differences in overweight/obesity prevalence between two surveys were assessed for significance using z test. T-tests were performed to test for any significant difference in means weight, height and BMI between two surveys. Analysis of variance (ANOVA) was used to examine differences in fitness results among age groups, gender and BMI groups.

To examine the independent impact of fitness and obesity on the risk of hypertension, multivariate logistic regression analysis was conducted with age group, gender, BMI category and cardiorespiratory fitness level as the independent predictor variables. Participants in the extreme quartiles within each age and gender were classified as "unfit"(the lowest quartile) and "fit"(the highest quartile) (Huang et al., 2002).

4.3 Results

4.3.1 Changes in weight, height and BMI between 1999 and 2001

Weight, height, and BMI of Taiwanese children and adolescents are presented in Table 6. For boys, weight, height and BMI increased significantly in each group across the two time points (weight and height: each group $p<.001$; BMI: age6-11:, $p<.001$, 12-14: $p=.006$, 15-18: $p=.004$). Among girls, a significant increase was also observed in weight and height in every age group over the two-year period (all $p<.001$), except the group aged 15-18 where weight declined significantly ($p=.001$). A significant increase in BMI was found only in the 12- to 14-year girls ($p<.001$) from 1999 to 2001. In contrast, girls aged 15-18 showed a significant decrease in BMI ($p<.001$).

Table 6: Sample size, mean weight (kg), height (cm), and BMI (kg/m^2)

	Sample size		Weight (SD)		Height (SD)		BMI (SD)	
	1999	2001	1999	2001	1999	2001	1999	2001
Boys								
6-11	3,069	6,275	30.5(8.4)	32.4(10.7)	130.5(10.1)	132.8(11.6)	17.7(3.0)	18.0(3.7)
12-14	1,997	2,877	47.6(12.5)	51.4(13.0)	153.8(11.0)	158.8(9.8)	19.9(3.4)	20.2(4.0)
15-18	1,965	3,215	61.5(11.3)	62.9(12.5)	169.7(7.2)	170.5(7.1)	21.3(3.3)	21.6(4.0)
Subtotal	7,031	12,367	44.0(16.7)	44.8(17.6)	148.1(19.2)	148.6(19.4)	19.3(3.5)	19.4(4.1)
Girls								
6-11	3,040	5,622	29.9(8.20	30.7(9.3)	130.7(11.1)	132.4(12.1)	17.2(2.6)	17.1(3.1)
12-14	1,717	2,538	45.3(9.1)	47.7(10.0)	152.7(7.5)	155.3(6.9)	19.2(2.8)	19.7(3.7)
15-18	2,147	4,059	52.7(8.6)	51.9(8.4)	158.4(5.9)	159.2(5.7)	21.0(3.2)	20.5(3.0)
Subtotal	6,904	12,219	40.8(13.2)	41.3(13.5)	144.8(15.5)	146.1(15.8)	18.9(3.3)	18.8(3.5)

4.3.2 Prevalence of overweight and obesity

Prevalence of overweight and obesity by gender and age group, for each of the two surveys is shown in Table 7. The overall prevalence of overweight in boys was 14.1 % in 1999 and 18.6% in 2001. Among girls, it remained at about 13% in both surveys. The overall obesity prevalence for boys was 5.7% in 1999 and 8.2% in 2001. It was lower in girls with 2.4% in 1999 and 3.6% in 2001.

Table 7: Prevalence (%) of overweight and obesity

	Sample size		Overweight		Obese		Overweight/obesity		
	1999	2001	1999	2001	1999	2001	1999	2001	Z test[1]
Boys									*p*
6-11	3069	6275	15.3	19.5	7.3	10.0	22.6	29.5	*<.001*
12-14	1997	2877	15.8	20.2	5.6	7.5	21.4	27.6	*<.001*
15-18	1965	3215	10.5	15.6	3.3	5.3	13.8	20.8	*<.001*
Subtotal	7031	12367	14.1	18.6	5.7	8.2	19.8	26.8	*<.001*
Girls									
6-11	3040	5622	15.3	17.1	3.7	4.9	18.9	22.0	*.0020*
12-14	1717	2538	13.9	13.4	0.3	3.6	14.2	17.1	*.0286*
15-18	2147	4059	8.4	7.1	2.1	1.7	10.6	8.7	*.0470*
Subtotal	6904	12219	12.8	13.0	2.4	3.6	15.2	16.5	*.0470*

[1] Significance in overweight/obesity differences between 1999 and 2001 surveys

The prevalence of overweight/obesity was significantly higher in boys than girls across all age groups in both surveys ($p<.01$). Within each survey, a significant reduction in prevalence with age is seen. The group with least incidence is adolescent girls aged 15-18 years. Results are therefore consistent across the two surveys giving confidence in the reliability. Through the two-year period, the prevalence of overweight/obesity increased significantly for both genders across all age groups, except the 15-18-year-old girls with a significant decrease in overweight/obesity prevalence.

4.3.3 Associations between obesity and physical fitness

Table 8 shows the means for each of the fitness tests and the results from ANOVA are presented in Table 9. The normal weight group performed better ($p<.05$) than the overweight/obese group in all tests in both surveys except in the 2001 sit-and-reach test where there were no differences between the two groups.

There was a significant interaction in both data sets between obesity and age for the step test. This revealed that the normal weight group had better performance than the

overweight/obese group and that this difference was greater in children than adolescents in both surveys. The difference in cardiovascular fitness between overweight/obese and normal children therefore decreases into adolescence.

A significant interaction between obesity and gender in the bent-leg curl-ups test showed that the difference between overweight/obese and normal weight groups was greater for boys than girls. This interaction effect was also seen for step test results in the 2001 data and for the sit-and-reach test in the 1999 data. This is perhaps explained by the greater incidence and severity of obesity in the boys when compared to girls.

Table 8: Means in fitness between overweight/obese and normal weight groups

	Sample size		Bent-leg curl-ups (SD)		Sit-and-reach (SD)		Step Test (SD)	
	Overweight /obese	Normal weight	Overweight /obese	Normal weight	Overweight /obese	Normal weight	Overweight /obese	Normal weight
1999 Boys								
6-11	694	2375	18.1(10.0)	22.4(9.0)	26.2(8.1)	26.8(7.5)	53.9(10.6)	58.8(10.5)
12-14	427	1570	27.1(8.4)	32.2(8.1)	24.6(8.5)	26.0(8.9)	58.1(9.7)	60.8(10.1)
15-18	271	1694	32.3(8.0)	35.0(7.4)	24.6(9.6)	26.6(9.6)	57.6(8.7)	60.5(9.7)
Subtotal	1392	5639	23.6(10.8)	28.9(10.0)	25.4(8.5)	26.5(8.6)	55.9(10.2)	59.9(10.2)
1999 Girls								
6-11	569	2465	19.8(9.2)	20.4(9.1)	29.0(8.8)	30.1(7.8)	51.0(9.1)	55.6(10.0)
12-14	244	1473	24.3(7.1)	25.8(7.1)	28.6(8.6)	27.6(8.4)	52.8(7.9)	57.0(9.6)
15-18	227	1920	23.1(10.0)	25.9(7.7)	29.8(10.5)	28.7(10.5)	51.9(8.8)	53.1(9.1)
Subtotal	1040	5858	21.6(9.2)	23.5(8.6)	29.1(9.1)	29.0(9.0)	51.6(8.8)	55.1(9.7)
2001 Boys								
6-11	1850	4417	21.8(9.5)	23.2(9.3)	26.5(11.3)	26.0(8.8)	53.8(9.4)	59.3(9.2)
12-14	795	2079	31.8(8.8)	35.3(8.4)	26.3(11.4)	26.2(11.9)	54.5(8.7)	58.6(10.1)
15-18	668	2546	35.6(8.3)	39.5(8.6)	28.2(10.1)	27.8(11.9)	53.7(8.5)	56.7(9.2)
Subtotal	3313	9042	27.0(10.9)	30.6(11.6)	26.8(11.1)	26.6(10.5)	54.0(9.0)	58.4(9.5)
2001 Girls								
6-11	1234	4384	19.4(9.0)	21.2(8.8)	29.3(11.1)	28.9(9.0)	53.2(8.8)	56.7(8.8)
12-14	433	2104	26.2(8.0)	29.0(8.1)	30.9(8.5)	30.1(16.5)	50.6(8.6)	53.8(8.7)
15-18	354	3703	27.5(8.8)	28.9(8.7)	30.8(9.2)	31.1(12.8)	51.2(7.9)	53.1(9.1)
Subtotal	2021	10191	22.3(9.5)	25.6(9.4)	29.9(10.3)	29.9(12.3)	52.3(8.7)	54.8(9.0)

Table 9: Analysis of variance in physical fitness according to obesity, age and gender

	$F_{obesity}$		F_{age}		F_{gender}		$F_{obesity*age}$		$F_{obesity*gender}$		$F_{obesity*age*gender}$	
1999		p		p		p		p		p		p
Bent-leg curl-ups	193.2	<.001	892.0	<.001	524.2	<.001	1.8	.166	35.6	<.001	8.2	<.001
Sit-and- reach	5.0	.026	15.0	<.001	221.2	<.001	1.2	.331	15.6	<.001	8.2	<.001
Step test	207.4	<.001	40.1	<.001	397.6	<.001	12.3	<.001	.2	.652	3.1	.044
2001												
Bent-leg curl-ups	248.0	<.001	2674.1	<.001	1397.2	<.001	10.5	<.001	9.0	.003	8.7	<.001
Sit-and- reach	2.8	.094	29.0	<.001	278.4	<.001	0.4	.668	.0	.967	.8	.472
Step test	486.8	<.001	75.4	<.001	344.4	<.001	14.7	<.001	16.5	<.001	1.8	.172

4.3.4 Obesity, cardiorespiratory fitness and blood pressure

Blood pressure data were available only for the 2001 survey. Table 10 shows the means of systolic and diastolic blood pressures for overweight/obese and normal weight groups. The overweight/obese group had significant higher systolic and diastolic pressures in both genders and in all age groups (all $p<.001$).

Table 10: Means in blood pressure between overweight/obese and normal weight groups

	Sample size		Systolic pressure (SD)		Diastolic pressure (SD)	
	Overweight /obese	Normal weight	Overweight /obese	Normal weight	Overweight /obese	Normal weight
Boys						
6-11	1852	4423	106.9(16.1)	98.6(16.4)	71.9(15.7)	64.8(14.6)
12-14	795	2082	120.4(16.1)	112.1(14.9)	76.8(15.3)	72.0(13.0)
15-18	669	2546	127.4(14.8)	119.3(74.5)	78.8(14.1)	74.5(11.6)
Subtotal	3316	9051	114.3(18.1)	107.5(18.0)	74.4(15.6)	69.2(14.1)
Girls						
6-11	1235	4387	104.5(17.8)	98.4(16.8)	70.9(16.9)	65.4(15.0)
12-14	433	2105	117.0(15.1)	108.4(14.6)	77.8(13.7)	71.7(11.8)
15-18	354	3705	119.4(16.1)	111.3(13.4)	77.3(14.3)	72.5(11.4)
Subtotal	2022	10197	110.0(18.2)	105.2(16.3)	73.5(16.1)	69.3(13.6)

Age group, gender, BMI category and cardiorespiratory fitness level were entered into a multivariate logistic regression analysis with incidence of hypertension as the dependent variable. The results (Table 11) showed that children and girls had lower odds of hypertension than 15-18-year-old adolescents and boys (*AOR=.61, 95%CI =.525-.704 and AOR=.80, 95%CI=.702-.906, respectively*). The overweight/obese group had over twice higher odds of hypertension than the normal weight group (*AOR=2.28, 95%CI=1.983-2.611*). The cardiovascular unfit group was nearly 30% more likely to suffer hypertension than the fit group (*AOR=1.28, 95%CI=1.121-1.455*). Fitness is therefore associated with lower risk of hypertension.

Table 11: Multivariate logistic regression for predicting risk of hypertension by age, gender, BMI and fitness groups

Variable	N	Hypertension[1] (%)	Multivariate Model		
			AOR[2]	CI 95%	*P*
Age					
Age6-11	9811	8.6	.61	.525-.704	*<.001*
Age12-14	4561	11.8	.89	.752-1.048	*.159*
Age15-18	6055	12.6	1		
Gender					
Girls	10014	9.0	.80	.702-.906	*.001*
Boys	10413	12.0	1		
BMI group					
Overweight/obese	4461	17.2	2.28	1.983-2.611	*<.001*
Normal	15966	8.6	1		
Fitness level					
Unfit	5142	13.1	1.28	1.121-1.455	*<.001*
Fit	5147	9.0	1		

In order to examine whether or not there was a significant association with hypertension between unfit and fit groups within each BMI category, participants were categorised by BMI category across cardiorespiratory fitness level. The results revealed that the normal weight-fit boys had a significantly lower risk of hypertension than the normal weight-unfit, overweight/obese-fit and overweight/obese-unfit boys (*AOR=1.26, 95%CI=1.015-1.567, AOR=1.79, 95%CI=1.311-2.441, and AOR=2.76, 95%CI=2.244-3.394, respectively*). The normal weight-fit girls had lower risk of hypertension than the overweight/obese-fit and overweight/obese-unfit girls (*AOR=1.97, 95%CI=1.352-2.872 and AOR=2.73, 95%CI=2.108-3.531, respectively*).

With the data of boys and girls combined, the results (Table 12 and Figure 16) revealed that the normal weight-unfit group was more likely to experience hypertension than the normal weight-fit group (*AOR=1.19, 95%CI=1.015-1.387*). The risk of hypertension increased nearly 2 times for the overweight/obese-fit group and nearly 3 times for the overweight/obese-unfit group compared to the normal weight-fit group (*AOR=1.93, 95%CI=1.514-2.451 and AOR=2.93, 95%CI=2.493-3.454, respectively*). However, these differences were not all significant when analysed separately by gender.

Table 12: Multivariate logistic regression for predicting risk of hypertension by age, gender and BMI category-cardiorespiratory fitness level

Variable	N	Hypertension[1] (%)	Multivariate Model		
			AOR[2]	CI 95%	*P*
Age					
Age6-11	9811	8.6	.60	.521-.699	*<.001*
Age12-14	4561	11.8	.88	.749-1.043	*.145*
Age15-18	6055	12.6	1		
Gender					
Girls	10014	9.0	.80	.705-.910	*.001*
Boys	10413	12.0	1		
BMI category-fitness					
Overweight/obese-unfit	1703	20.0	2.93	2.493-3.454	*<.001*
Overweight/obese-fit	682	14.4	1.93	1.514-2.451	*<.001*
Normal-unfit	3439	9.7	1.19	1.015-1.387	*.032*
Normal-fit	4465	8.2	1		

[1]: Systolic pressure>140 and/or Diastolic pressure>90; [2]: Adjusted Odds Ratio

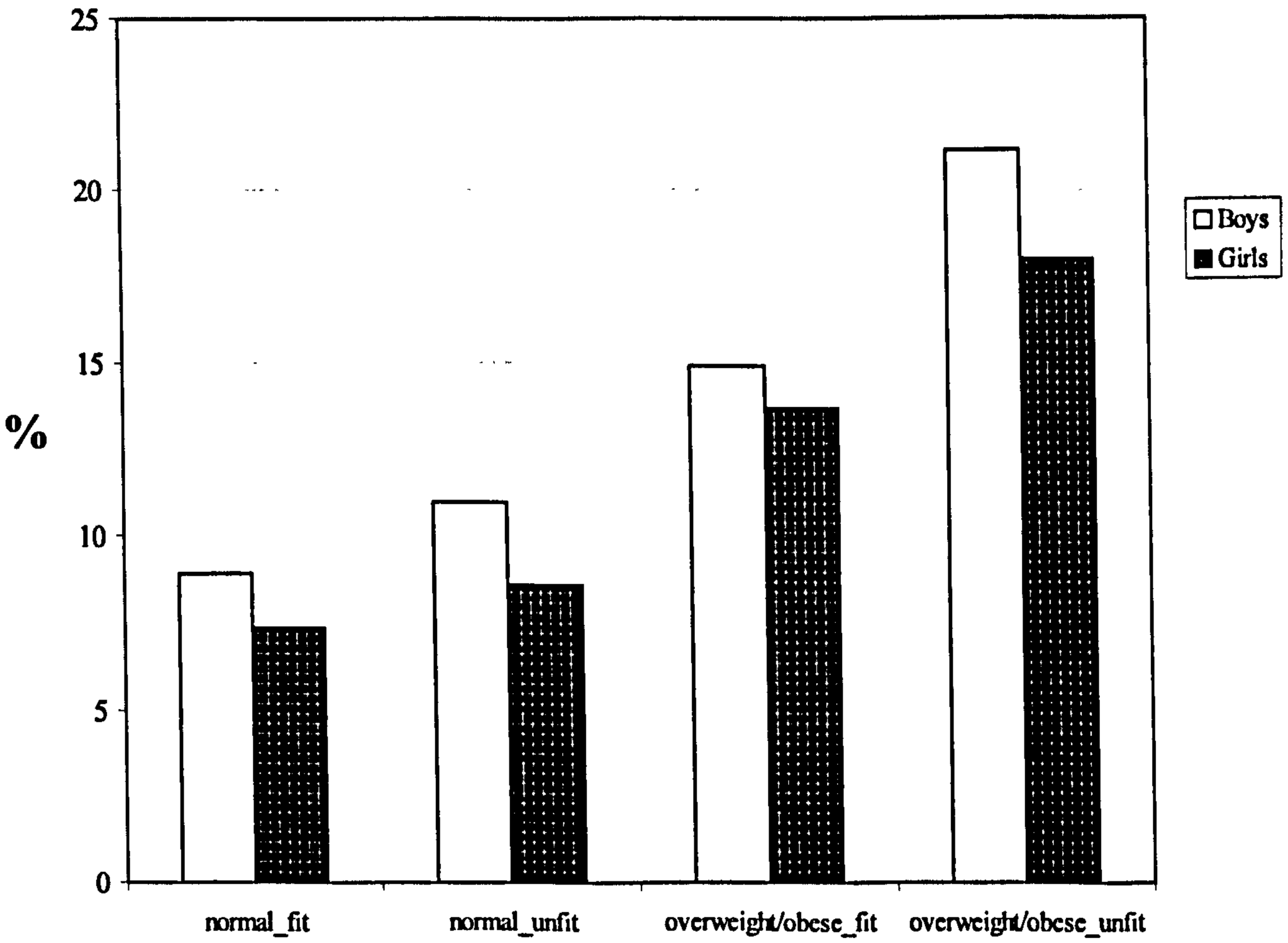

Figure 16: Percentage of hypertension by BMI category and cardiorespiratory fitness level

4.4 Discussion

4.4.1 Prevalence of overweight/obesity

Although direct comparison of overweight and obesity prevalence with children from other countries is difficult due to differences in the methods used for measurement of adiposity, the classifications of obesity, and the examined ages of the samples, some studies (Table 13) have been selected for comparisons with large samples using IOTF criteria in a similar time period among children and adolescents. Some caution is required when interpretatng of this table as BMI is partly dependent on body proportions which normatively vary across nations and ethnic groups. However, the original IOTF sample did include samples from Hong Kong and Singapore so have some direct relevance.

Table 13: Comparison of obesity prevalence from various countries (IOTF reference)

Country	Study	Year	Age	Sample size	Boy (%)			Girl (%)		
					Overweight	Obesity	Total	Overweight	Obesity	Total
Taiwan	NCPFS (This study)	2001	6-18	24586	18.6	8.2	26.8	13.0	3.6	16.5
			12-18	12689	17.7	6.3	24.0	9.5	2.4	11.9
Japan	(Matsushita et al., 2004)	1996-2000	9-11	6079 (Age 6-14)	18.4	4.0	22.4	17.2	3.0	20.2
			12-14	6079 (Age 6-14)	14.9	2.7	17.6	11.2	1.0	12.2
UK	Health Survey for England (2002)	2002	2-15	6390	16.3	5.5	21.8	20.3	7.2	27.5
			11-15	2406	17.8	6.4	24.2	21.2	7.6	28.8
US	Wang & Wang (2002)	1988-1994	6-9	2169			20.5			23.6
			10-18	3939			26.8			27.5

The results show that the overweight and obesity prevalence in boys is similar to the reported figures in the UK and US and higher than that found in Japan. The prevalence in girls is much lower than that in the US and UK and similar to the figures in Japan (Matsushita et al., 2004; UK Department of Health, 2003; Wang & Wang, 2002). The finding of a higher prevalence of overweight/obesity in children than in adolescents reflects similar findings in China (Wang, 2001; Wang et al., 2002).

It may be possible that the growth in obesity is so recent that it has primarily affected children. In addition, this study showed that the overweight/obesity prevalence in boys was significantly higher than that in girls, which has also been noted in other studies from Singapore (Fu et al., 2003) and China (Hui & Bell, 2003; Wang et al., 2002). This is in contrast to most Western countries. Hui and Bell (2003) indicated that differences in obesity prevalence between boys and girls in Western countries are not usually marked with girls tending to have higher prevalence than boys.

There are many contributors to the development of obesity, for example lack of physical activity, sedentary behaviours (e.g. television watching) and easily available foods rich in energy and fat (Calderon et al., 2005; Wabitsch, 2000a). This study found that older adolescent girls were less obese than other subgroups. Previous studies have demonstrated that physical activity decreases with age during adolescence and boys are more active than girls (Huang et al., 2002; Sallis et al., 2000; Stone et al., 1998). It is uncertain whether or not there are differences in eating habits between Taiwanese boys and girls. It is likely therefore that older adolescent girls are investing more overtly in weight control behaviours such as controlling energy intake compared with children and adolescent boys, perhaps as a response to the influence of cultural pressures to be slim (Wang et al., 2002). Studies have indicated that body dissatisfaction becomes more pronounced with increasing age for adolescent girls (Kaneko et al., 1999; Ricciardelli et al., 2001a).

Different cultural pressures to be slim are present in eastern cultures. Confucianism has had a strong influence in Taiwan as a male dominated patriarchal society (Slack et al., 2002; Yu et al., 2004). Men are depicted as strong and women as petite, feminine and in need of protection. Western cultural influences that are increasingly experienced in Taiwan, particularly in cities, may provide added pressures to the traditional values of feminity and petiteness. Despite these suggestions, the reasons for age and gender differences in this national sample remain unclear. Longitudinal studies are needed to track weight and height in preadolescents to young adults and to investigate influences of lifestyles and cultural values regarding the body alongside each other.

4.4.2 Obesity and physical fitness

In the present study, overweight/obese group had poorer performance in the bent-leg curl-ups test (muscular endurance) and step test (cardiorespiratory fitness) in both surveys. These results are consistent with other studies. Pongpragai et al. (1994) found that physical fitness was worse among obese children than among normal weight children in the sit-up test in Thailand. These findings are also in agreement with the results of Deforche et al. (2003) in Flemish youth.

In the sit-and-reach test, the results were more inconsistent. The ANOVA analyses revealed that the overweight/obese group showed poor performance than the normal weight group in the 1999 survey, while no difference was found between two groups in the 2001 survey. Chen et al. (2002) found that higher levels of BMI were associated with poor sit-and-reach performance, whereas other studies showed no differences in this test among obese and normal weight boys (Deforche et al., 2003; Pongprapai et al., 1994). Flexibility therefore seems to be consistently less influenced by weight.

4.4.3 Obesity, cardiorespiratory fitness and blood pressure

Previous studies have reported that obese children and adolescents had significantly higher blood pressure than the normal weight group (Burke et al., 2004; Chu et al., 1998; Reich et al., 2003). However, there has been less attention paid to the interactions among obesity, fitness and blood pressure in children and adolescents although this has been a feature of research with adults. Prospective studies have indicated that keeping or becoming fit is associated with subsequent reduced risk of mortality and morbidity in obese adults (Brodney et al., 2000; Lee et al., 1999). This study examined obesity and blood pressure (hypertension) taking cardiorespiratory fitness into consideration. The results revealed that the normal weight-fit group had lower risk of hypertension than the overweight/obese individuals whether they were

unfit or fit in both genders. When putting boys and girls together, it was found that the overweight/obese youngsters who were unfit were at significantly higher level of risk than those who were fit. These relationships are cross sectional but support the findings with adults that being fit as an overweight or obese individual is associated with reduced risk of various aspects of morbidity (Brodney et al., 2000; Lee et al., 1999). The failure to reach significance when analysed separately by gender might due to the lack of power as numbers of overweight/obese-unfit group were reduced to 278 for girls and 404 for boys.

The authors were also aware of the lack of foundation for the definition of hypertension. In children and adolescents, blood pressure standards may be based on gender, age, and height to provide a more precise classification of blood pressure (National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents, 2004). However, current charts are based on a US population and unlikely to be valid throughout the rest of the world (Materson, 2003). A study showed that there are geographical and ethnic variations in blood pressure in adolescents, indicating that acceptance and use of non-population-specific blood pressure distribution may lead to under-or overdiagnosis of hypertension (Pall et al., 2003). In Taiwan, there remain no published cut-points for hypertension in children and adolescents currently and the government have adopted the adult criteria of 140/90 mmHg (Taiwan Department of Health, 2004). Future research is required to provide valid characterisation of hypertension in the Chinese adolescent population before the effect of excess weight and lack of fitness can be fully determined.

The present study adopted objective measures of weight, height and fitness tests in two national surveys with nationally representative Taiwanese samples. It provides a reliable data for understanding the current prevalence in overweight and obesity, as well as the associations with physical fitness and blood pressure. In addition, the findings in the obesity prevalence base on the international reference standards, which can be used for the international comparison.

4.5 Conclusion

Overall, the findings demonstrated that there is an increasing trend in overweight/obesity prevalence for Taiwanese youth in a two-year period, and a clear gender difference with boys being more overweight and obese. The prevalence of overweight and obesity was higher among children than among adolescents. These key findings have also been published (appendix 2).

Physical activity has been found to be associated with lower prevalence of obesity (or lower BMI) (Christodoulos et al., 2006; Eisenmann et al., 2002). Then, would it suggest that Taiwanese young boys might be less active than other subgroups since they are the most overweight or obese? Additionally, after controlling for age and gender, the overweight/obese group tended to have poor muscular strength and cardiovascular endurance than their lean counterparts. The overweight/obese and unfit group had a greater risk of hypertension than other groups. In light of these findings, understanding the physical activity behaviour among adolescents and identifying subgroups at high risk may be beneficial for the design of physical activity promotion and interventions. These are needed to prevent the increasing obesity prevalence. The following study, outlined in Chapter 5, will therefore evaluate the physical activity patterns and identify the risk subgroups for being physically inactive among Taiwanese adolescents.

CHAPTER 5 Study 2: Physical activity in Taiwanese adolescents

5.1 Introduction

The WHO has calculated that poor diet and physical inactivity will soon become the leading contributor to disability, disease, and premature mortality (World Health Organisation, 2004a). Epidemiological research has also demonstrated that physically active people have reduced risk of several chronic diseases including heart disease, some cancers, type 2 diabetes, obesity and depression among adults (Department of Health and Human Services, 1996; UK Department of Health, 2004; World Health Organisation, 2003). Although more studies are needed, the evidence reviewed in Chapter 2 indicates that physical activity results in some physical and psychological benefits for young people, including healthy bone and muscle development, reduced incidence of hypertension, healthy blood lipid profile, and enhanced psychological well-being (Bailey et al., 1994; Calfas et al., 1994; Ekeland et al., 2004; Mutrie et al., 1998; Riddoch, 1998; Tolfrey et al., 2000).

Despite the suggestion that physical activity is beneficial for youth and the inclusion of physical activity in most health promotion recommendations (e.g., Move for Health – Active Youth) (World Health Organisation, 2004b), large sectors of the adolescent population in many countries are insufficiently active for optimal health benefits (Canadian Fitness and Lifestyle Research Institute, 2002; Department of Health and Human Services Centers for Disease Control and Prevention, 2004; UK Department of Health, 2004). Previous studies have investigated prevalence of activity and relevant factors that may be associated with low levels of participation. A consistent finding is that physical activity declines with age during adolescence in particular with girls at all ages substantially less active than boys (Hong Kong Sports Development Board, 2001; Lasheras et al., 2001; Sallis et al., 2000; Stone et al., 1998). However, most of the studies have been conducted in Western countries. Three reviewed studies in adolescent physical activity revealed that the majority of studies were conducted in the US (Biddle et al., 2005; Sallis et al., 2000; Stone et al., 1998), suggesting a potential gap in the literature on understanding physical activity

determinants in non-Western countries where inactivity is becoming a much more salient issue than in previous decades.

Very few studies have been conducted in Asian countries (Hui, 2001; Hui et al., 2001), and even fewer studies having been conducted addressing Taiwanese adolescents' participation in physical activity (Wu et al., 2003; Wu & Pender, 2002). However, there are considerable socio-economic, political and cultural differences between South East Asian and Western countries that may influence patterns of physical activity. It is not clear whether the same determinants of physical activity for adolescents in most Western countries would be relevant, given these differences. Hence, any health promotion strategies and programmes would benefit from appropriate cultural understanding. Therefore, it is essential that physical activity is studied within a social and cultural context to tap into the most pertinent and appropriate factors for adolescents.

To date, there are few nationally representative data on the prevalence of physical activity among Taiwanese adolescents and little is known about the socio-demographic and/or behavioural factors associated with activity and inactivity. There is a need for baseline data on the activity levels and patterns of adolescents in Taiwan in order to provide guidance for more effective health promotion policies. The objectives of this study were therefore to (a) profile the prevalence of physical activity among Taiwanese adolescents, (b) identify groups at risk of low physical activity, and (c) examine the relationships between physical activity and other health-related behaviours.

5.2 Methods

5.2.1 Sample

Data were extracted from the 2001 National Health Interview Survey conducted by the Department of Health in Taiwan between 2001 and 2002. It is a periodic

nationwide cross-sectional study aiming at understanding the general health of the population, with a representative sample selected from the National Registry Database through multi-stage stratified systematic sampling (Lan et al., 2006). It first stratified the whole Taiwan area into seven strata according to the degree of urbanization, geographic location, and administrative boundaries (Chang et al., 2005), with a total of 25464 participants. For this study, data on 12-18 year olds were extracted, providing a sample of 2235 (1157 boys and 1078 girls) adolescents in Taiwan.

5.2.2 Measures

The data reported were taken from the Personal Health Behaviours and Adolescent Questionnaire in the National Health Interview Survey. The socio-demographic variables, sedentary time, and physical activity were collected from the Personal Health Behaviours section, which were self-reported through face-to-face interview. The information for parents' education levels and health-related behaviours (smoking, drinking, and using drugs) was taken from the Adolescent Questionnaire, which was self-reported through a questionnaire. All the questionnaires, based on literature, were developed collaboratively by a multidisciplinary team of researchers with three pilot studies conducted to ensure consistency and reliability.

5.2.3 Physical activity and sedentary time

Participation in physical activity was assessed using the following question: 'Did you participate in any physical activity in the past 2 weeks?' The respondents answered either 'Yes' or 'No'. Respondents who answered 'Yes' were asked to identify the type of physical activity they engaged in from 13 named activities (including walking, jogging, rope skipping, swimming, gymnastics, ball sports, aerobic dance, dance, cycling, mountain climbing, weight lifting, stair climbing and playing hoola hoop) and an open category for other activities was also available. Then, respondents indicated the frequency with which they performed each activity in the past 2 weeks and the average duration per session. The total frequency was divided by 2 for a weekly estimate. They were also asked to report the intensity of breathing during engagement. Respondents who reported participating in physical activity 3 or more

times a week for at least 30 minutes that made them breathe hard were classified as 'High active' (meeting the recommended level) (Taiwan Executive Yuan, 2004), which is similar to the classification of sufficient vigorous activity in the US (Department of Health and Human Services Centers for Disease Control and Prevention, 2004). Respondents defined as 'Low active' were those who took part in physical activity but did not meet the recommendation. Those who engaged in no physical activity were categorised as 'Inactive'. The validity and reproducibility for these physical activity questions have been reported in previous research (Lan et al., 2006).

In addition, respondents were asked the average numbers of hours spent sitting down each day. The responses for sedentary time were subsequently grouped into 3 levels: under 8 hours, 8≤hours<12, and over 12 hours.

5.2.4 Demographic factors

This study also assessed socio-demographic variables and estimates of other health-related behaviours. Respondents were categorised by age into early adolescence (age 12-14) and late adolescence (age 15-18). Other variables were gender, education status (non-students, junior high school, senior high school, and college/university), parental education level (low, middle, and high), residential location (urban and rural), and BMI (normal/underweight, overweight, and obese). Non-students included those who had left school and currently worked or did not work. The level of education attained by respondents' mothers and fathers were coded as 1) no formal education (no schooling), 2) primary school (1-6 years schooling), 3) junior high school (7-9 years schooling), 4) senior high school (10-12 years schooling), 5) college and higher (more than 13 years). A parental education variable was created by adding father's and mother's education score. Then, the parental education scores were further categorised into three levels: low (score 2-4), middle (score 5-8), and high (score 9-10). Residential location was classified in 2 categories based on the population of the areas: urban (population≥150,000) ≥and rural (population<150,000). BMI was calculated as weight (kg) divided by height (m) squared (kg/m2) using self-reported weight and height. BMI scores were initially grouped into 3 categories

(normal/underweight, overweight, and obese) by the IOTF criteria (Cole et al., 2000), which have been used in many recent studies (Lobstein et al., 2004; Wang & Wang, 2002). After initial calculations found low obesity prevalence, BMI was recoded for some analyses into a binary variable: weight status, which included 2 groups: overweight/obese and normal weight.

5.2.5 Associated health behaviour

With regard to health-related behaviours, respondents were asked 'Are you trying to control your weight?' The answers included 'trying to: 'lose weight', 'maintain weight', 'gain weight', and 'not controlling'. The methods of weight control were also provided for those who are trying to control weight. Specific types of weight-control methods were asked with the following questions: 'Have you done any of the following things in order to lose weight or keep from gaining weight?' (Yes or No for 12 methods, one open option is also available). Respondents were classified into three groups: 1) Healthy exercise (used exercise to control weight); 2) Healthy dieting (ate fewer snacks, fewer calories, food low in fat, more fruit and vegetable, regular eating/no supper); 3) unhealthy methods (skip meal, fast (without eating for more than 24 hours), take medicines (diet pill, laxative, emetic) or vomit).

In addition, smoking status was classified into 3 groups: 'Never', 'Occasional: have smoked but less than 5 packs of cigarettes throughout their lifetime', and 'Regular: smoked more than 5 packs of cigarettes throughout their lifetime'. Drinking status was divided into 3 categories, which were classified as 'Never', 'Occasional': those who consumed alcoholic drinks once or less than once a week on average, and 'Regular': those who consumed alcoholic drinks twice or more than twice a week on average. The levels of drug use had 2 categories, yes and no. The answer 'Yes' meant respondents had used illegal drugs.

5.2.6 Data analysis

Descriptive statistics on activity levels by age and gender were calculated to describe the characteristics of the groups of respondents. T-tests were used to compare group means on key variables. Univariate logistic regression analysis was performed to

evaluate the relationships between physical activity and demographic and associated health behaviour variables. Variables showing significant relationships were then entered into a multivariate logistic regression model to explore the most powerful determinants of engaging in physical activity. All the statistical analyses were carried out using the SPSS 12.0 statistical package.

5.3 Results

5.3.1 Prevalence of physical activity and sedentary time

The prevalence of physical activity, sedentary time, and the socio-demographic characteristics of respondents are presented in Table 14. The prevalence of engaging in any level of physical activity was 78.2% among adolescents (81% for boys and 75.1% for girls, respectively). Among boys, more than 89% of adolescents aged 12-14 engaged in physical activity, while only 76.3% of adolescents aged 15-18 participated in physical activity. Likewise, more early adolescent girls engaged in physical activity than late adolescents (83.3% and 69.3%, respectively). When the Taiwan recommendation of physical activity was considered, it was found that only 28.4% of adolescents met the recommended level. For boys, 36.9% of early adolescents reached the recommended level, while less than 30% of late adolescents met this level. In girls, 28.4% of early adolescents and only 21.8% of late adolescents met the recommendation.

The mean amount of sedentary time for all respondents was 9.5 hours per day. The majority of respondents (76.7%) reported sitting more than 8 hours each day and the proportion sitting more than 12 hours was over 30% (ranged from 27.2% for older boys to 32.5% for older girls) (Table 14). Results revealed that there was a significant difference in the average sedentary time between boys (Mean=9.3, SD=3.50) and girls (Mean=9.7, SD=3.25) (t=-2.884, p=.004). For boys, those engaging in physical activity had higher sedentary time than those having no physical activity (t=-3.438, p=.001). The 12-14-year-old boys spent more time being sedentary than 15-18-year-

old boys (t=3.898, p<.001). The overweight/obese had higher sedentary time than normal weight adolescents t=2.765, p=.006). Urban youth, students, non-smokers, non-drinkers, and those trying to control weight had higher sedentary time than compared groups (t=2.043, p=.041; t=6.932, p<.001; t=6.582, p<.001; and t=2.801, p=.005, respectively). For girls, only three variables showed a difference in sedentary time. Those girls engaging in physical activity had higher sedentary time than those having no physical activity (t=4.132, p<.001). Female students and non-smokers also spent more time being sedentary (t=6.053, p<.001 and t=2.354, p=.019, respectively).

Table 14: Physical activity, sedentary time, and socio-demographic variables

Variable	Boys		Girls	
	12-14	15-18	12-14	15-18
Sample size (N)	423	734	450	628
Mean height (cm)	161.0	171.5	156.2	59.4
Mean weight (kg)	52.8	62.4	47.4	50.9
Mean BMI (kg/m^2)	20.3	21.1	19.4	20.0
Education status (%)				
Non-students	0	9.6	0	7.2
Junior high school	98.2	8.8	99.0	7.8
Senior high school	1.8	65.7	0.7	64.1
College/university	0	15.9	0.2	21.0
Parental education level (%)				
Low	9.8	13.2	7.7	14.5
Middle	66.5	67.6	70.9	64.7
High	23.7	19.3	21.4	20.9
Residential location (%)				
Urban	55.8	59.7	55.6	59.2
Rural	44.2	40.3	44.4	40.8
Engage in physical activity (%)				
No: Inactive	10.9	23.7	16.7	30.7
Yes: Low active	52.2	47.3	54.9	47.5
Yes: High active (Meet the recommended level)	36.9	29.0	28.4	21.8
Sedentary time (%)				
Under 8 hrs	19.2	31.1	15.8	22.1
8 ≤ hrs <12	49.1	41.7	54.2	45.4
Over 12 hrs	31.8	27.2	30.0	32.5

Figure 17 shows the percentage of adolescents being inactive and being sedentary more than 12 hours each day by age. The peaks of 'sedentary over 12 hours' occurred at age 14 during early adolescence, and at age 17 during late adolescence. However, the prevalence of inactivity grew with increasing age. Of those being sedentary over 12 hours, 19.8% were inactive, while more than 80% of them still engaged in some

level of physical activity. All in all, adolescents engaging in physical activity sat down more than those being inactive and girls had higher sedentary time than boys.

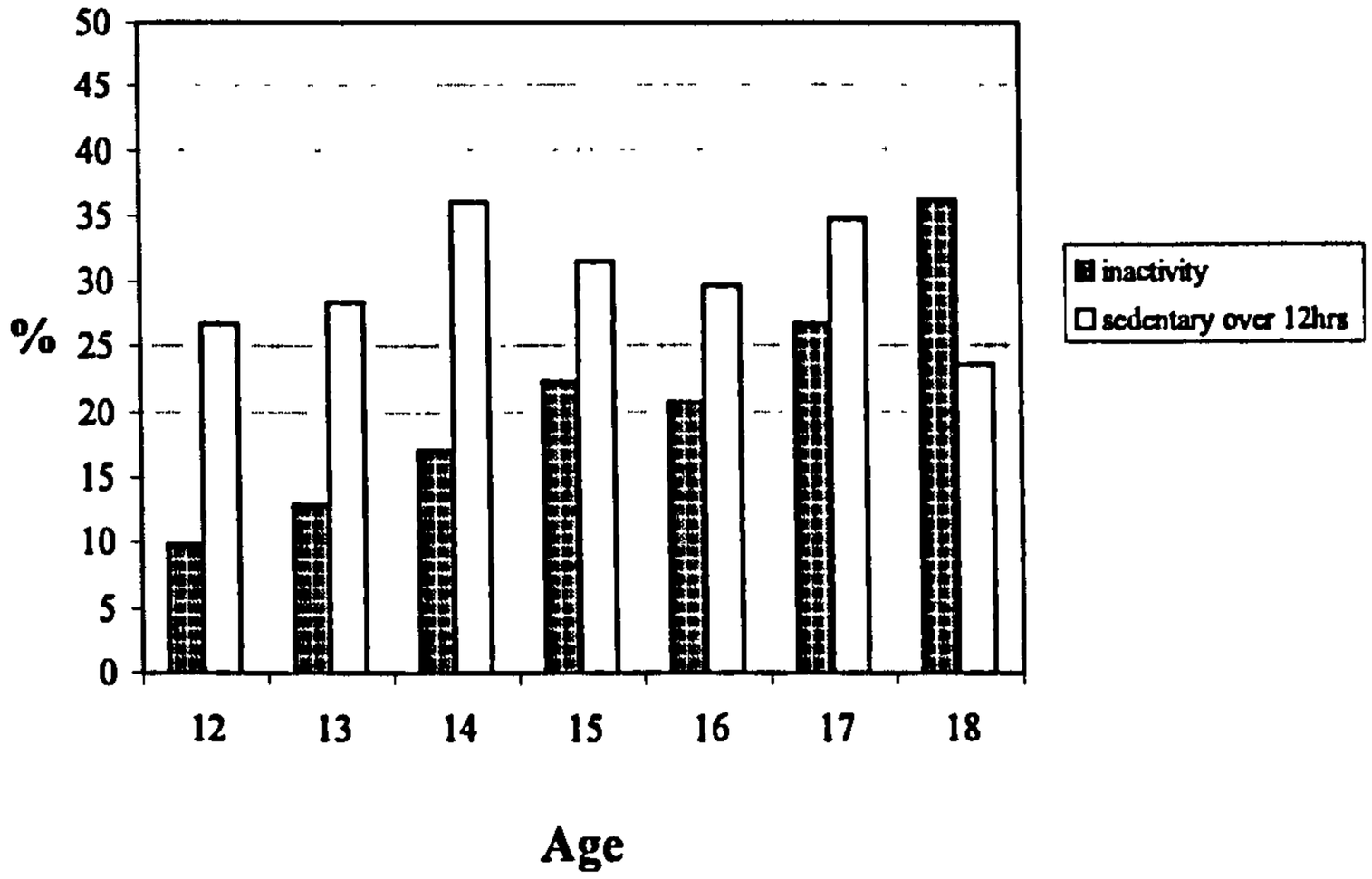

Figure 17: Percentage of being inactive and sedentary over 12hrs

5.3.2 Relationships with socio-demographic variables and health-related behaviours

The results of the univariate and multivariate logistic regressions are presented in Table 15. The univariate analyses showed that eight variables were significantly associated with physical activity. Upon completion of univariate analyses, significant variables were selected for the multivariate analysis. In this study, three variables (parental education level, weight status and drug use) were not significant in the univariate test (p=.078, p=.242, and p=.280, respectively). However, since parental education level and weight status p-values were less than .25, the two variables were still considered candidates for the multivariate model. Hosmer et al. (2000) and Wang and Ghou (2003) suggested that variables whose univariate test had a p-value <.25 should be included in the multivariate model, since using a more traditional level (such as 0.05) often failed to identify variables known to be important. Use of the traditional level has the disadvantage of excluding variables that are potentially important at the model building stage.

In the multivariate model, eight variables including sedentary time, age, gender, education status, residential location, smoking status, drinking status, and weight control behaviours were significantly associated with engaging in physical activity. Early adolescents and boys had two times greater odds of engaging in physical activity than late adolescents and girls, respectively. College/university students were more likely to be active than non-students (AOR= .30, 95%CI= .17-.55); senior high school students were nearly 60% more likely to engage in physical activity than college/university students. Respondents living in urban areas were 30% more likely to engage in physical activity than those living in rural areas. In addition, adolescents who did not control their weight were less likely to engage in physical activity than those who wanted to lose weight (AOR=3.17, 95%CI= 2.08-4.81) and those who wanted to maintain weight (AOR=2.48, 95%CI= 1.65-3.72).

With regard to health-related behaviours, results indicated that smoking and drinking had significant associations with physical activity engagement. In the univariate model, adolescents who smoke or drink regularly were more inactive than those who never smoke or drink (AOR=3.09, 95%CI= 2.09-4.57 and AOR=4.36, 95%CI= 1.46-13.05, respectively). Regular smokers were also less active than occasional smokers in both univariate and multivariate models (AOR=4.21, 95%CI= 2.27-7.83 and AOR=3.22, 95%CI= 1.42-7.34, respectively). No significance was found among drinking levels in the multivariate model.

Table 15: Univariate and Multivariate logistic regression analyses of engaging in PA [a]

Variable	N	Engaging in PA[a] (%)		Univariate Model			Multivariate Model		
		No	Yes	COR[b]	CI 95%	*p*	AOR[c]	CI 95%	*p*
Age						.000		1.45-4.15	.001
Age12-14	870	13.9	86.1	2.29	1.83-2.87		2.45		
Age15-18	1361	26.9	73.1	1			1		
Gender						.001		1.65-2.77	.000
Boys	1155	19.0	81.0	1.41	1.15-1.72		2.14		
Girls	1076	24.9	75.1	1			1		
Education status						.000			.000
Non-students	110	65.5	34.5	.21	.13-.34		.30	.17-.52	.000
Junior high school	916	14.7	85.3	2.27	1.62-3.17		1.19	.68-2.08	.553
Senior high school	853	20.4	79.6	1.53	1.10-2.12		1.59	1.12-2.26	.010
College/university	238	28.2	71.8	1			1		
PEL[d]						.078			.969
Low	237	24.5	75.5	.65	.44-.96		1.00	.64-1.57	.998
Middle	1343	21.4	78.6	.77	.58-1.03		1.03	.75-1.42	.835
High	419	17.4	82.6	1			1		
Residential location						.010			.034
Urban	1293	19.9	80.1	1.31	1.07-1.60		1.31	1.02-1.69	
Rural	939	24.5	75.5	1			1		
Weight status						.242			.054
Overweight/obese	293	18.8	81.2	1.21	.88-1.65		.69	.48-1.01	
Normal weight	1794	21.8	78.2	1			1		
Smoke						.000			.020
Never	2005	20.9	79.1	3.09	2.09-4.57		1.53	.87-2.69	.139
Occasional	117	16.2	83.8	4.21	2.27-7.83		3.22	1.42-7.34	.005
Regular	109	45.0	55.0	1			1		
Drink						.002			.032
Never	2082	21.1	78.9	4.36	1.46-13.05		.68	.13-3.39	.633
Occasional	133	30.1	69.9	2.71	.86-8.58		.36	.07-1.83	.216
Regular	13	53.8	46.2	1			1		
Drug use						.280			
No	2098	21.1	78.9	1.64	.67-4.01				
Yes	23	30.4	69.6	1					
Sedentary time						.000			.003
Under 8 hrs	519	31.8	68.2	.53	.41-.69		.72	.52-1.00	.050
8 ≤ hrs<12	1042	18.2	81.8	1.10	.86-1.41		1.22	.91-1.62	.181
Over 12 hrs	673	19.8	80.2	1			1		
Weight control						.000			.000
Lose weight	313	13.4	86.6	2.16	1.53-3.05		3.17	2.08-4.81	.000
Maintain weight	284	14.4	85.6	1.99	1.40-2.82		2.48	1.65-3.72	.000
Gain weight	52	13.5	86.5	2.16	.96-4.82		2.59	.97-6.91	.058
Don't control	1582	25.1	74.9	1			1		

Note: 1. Omnibus Tests of Model Coefficients: .000 2. Hosmer and Lemeshow Test: .162
3. Classification Table: Predicted Percentage Correct is 80.5 (The cut value is .500)
[a]: physical activity [b]: Crude Odds Ratio [c]: Adjusted Odds Ratio [d]: Parental education level

5.3.3 Type of physical activity

The most common physical activities in Taiwanese adolescents are presented in Table 16 by age group and gender. The preferences of physical activity were the same in all boys and young girls with ball sports being the most popular activity, followed by cycling, jogging, gymnastics, and swimming. For older adolescent girls, ball sports also occupied the first place. However, jogging jumped into the second place, replacing cycling, which slipped to the fourth place behind gymnastics. Meanwhile, hoola hoop replaced swimming as the fifth most popular activity in this subgroup.

Table 16: The top five popular activities in Taiwanese adolescents

	Boys		Girls	
Ranking	Age12-14 (N=377)	Age15-18 (N=560)	Age12-14 (N=375)	Age15-18 (N=435)
1 (%)	Ball sports (61)	Ball sports (66)	Ball sports (38)	Ball sports (37)
2 (%)	Cycling (16)	Cycling (9)	Cycling (15)	Jogging (12)
3 (%)	Jogging (6)	Jogging (7)	Jogging (13)	Gymnastics (11)[a]
4 (%)	Gymnastics (4)[a]	Gymnastics (4)[a]	Gymnastics (13)[a]	Cycling (8)
5 (%)	Swimming (3)	Swimming (3)	Swimming (6)	Hoola hoop (8)

[a] Gymnastics: including Gymnastics, Tai Chi, Kung Fu and Martial Art

5.3.4 Weight control behaviour and method

Overall, a large proportion of Taiwanese adolescents reported that they did not control their weight (77.4% in boys and 64.0% in girls, respectively) (Table 17). The prevalence of not controlling weight was higher among boys and the trend showed a decrease with increased age in both genders. Around 9.6% of boys and 18.7% of girls reported that they were trying to lose weight. The prevalence of trying to lose weight was higher among girls than boys across age groups, with the highest rate being in the 15-18-year-old girls (21%).

Among those who were trying to control weight, healthy exercise and dieting methods were commonly adopted. Similar proportions were found between exercise and dieting methods in boys (49.2% vs. 46.0% in 12-14-age group; 43.8% vs. 44.9%

in 15-18-age group), while girls reported significant higher dieting than exercise methods (48.9% vs. 39.9% in 12-14-age group; 57.5% vs. 28.5% in 15-18-age group). The unhealthy methods increase with increased age in both genders (4.8% to 11.1% in boys; 11.1% to 14.0% in girls, respectively).

Table 17: Prevalence of weight control behaviour and method

(%)	Boys		Girls	
	12-14	15-18	12-14	15-18
Sample size (N)	423	734	450	628
Behaviour				
Don't control weight	79.9	76.0	70.2	59.6
Lose weight	9.2	9.9	15.4	21.0
Gain weight	3.8	2.7	1.3	1.6
Maintain weight	7.1	11.3	13.1	17.8
Weight loss method				
Healthy exercise	49.2	43.8	39.9	28.5
Healthy dieting	46.0	44.9	48.9	57.5
Unhealthy method	4.8	11.1	11.1	14.0

5.4 Discussion

5.4.1 Prevalence of physical activity and sedentary behaviour

This study illustrates that nearly 80% of Taiwanese adolescents engage in some level of physical activity. There was a decline in activity with age, a clear gender difference with girls being less active, and girls in the 15-18-age range being the least active sector. These findings are similar to most published studies (Canadian Fitness and Lifestyle Research Institute, 2002; Hong Kong Sports Development Board, 2001; Lasheras et al., 2001; Sallis et al., 2000), but have not been previously reported in a representative sample of Taiwanese adolescents.

A high proportion of adolescents (nearly 80%) reported being sedentary more than 8 hours a day. Academic performance is highly valued for Chinese, and students study for eight hours per day in schools in Taiwan. Two peaks occurred in mean sedentary time when assessed across age groups. These were at 14 and 17 in both genders, which coincide with years of study for national examinations for secondary schools and university entrance in Taiwan. However, it is noticeable that about 80% of this

group still participated in some physical activity. A meta analysis of the association between sedentary behaviour and physical activity has been found to be relatively weak with small and negative relationship between TV viewing and physical activity (Marshall et al., 2004). Feldman et al. (2003) examined the relationship between different types of sedentary pursuits and physical activity. The results suggested that increased time spent in positive sedentary behaviours (e.g., reading or doing homework) was associated with increased physical activity. Therefore, some Taiwanese youngsters are probably attempting to counteract their long study periods by engagement in sport or exercise. However, it is not possible to distinguish academically-relevant sedentary behaviours from recreational sedentary behaviours in this study due to the lack of specificity of the sedentary behaviour measure.

5.4.2 Correlates of physical activity

Consistent with other findings, more urban adolescents participated in physical activity than rural adolescents. This parallels evidence in Spain and Australia, suggesting that culture or societal background has little impact on urban/rural differences and that it is perhaps a ubiquitous occurrence (Australia Institute of Health and Welfare, 2003; Lasheras et al., 2001). The reasons may be that urban adolescents have more opportunities to access sport facilities and also have more choices for recreational and leisure activities.

Non-students were found to be the least active and more than half of them are totally inactive. They tend to be ignored in the young population, since only a minority of adolescents are out of schools. As most physical activities are promoted in school settings, non-students miss out on participating in a variety of activity and have limited experience of physical activity; hence, more attentions should be paid to this subgroup.

The prevalence of unhealthy behaviours is much lower than in the US and UK (Department of Health and Human Services Centers for Disease Control and

Prevention, 2004; UK Department of Health, 2002), especially for girls (Smoking: 16% in boys and 4% in girls; drinking: 10% in boys and 3% in girls; using drugs: 1% in both boys and girls). Although the numbers in these subgroups were small, about half of the regular smokers or drinkers were totally inactive suggesting that these unhealthy behaviours might cluster together in Taiwanese adolescents. These findings compare with the equivocal findings for adolescents from westernized countries. In a review, Sallis et al. (2000) concluded that the relationship between smoking and physical activity was indeterminate and alcohol use was unrelated to physical activity among adolescents. Drug consumption was also found to have no association with physical activity by Lasheras and his colleagues (2001). On the other hand, other research (Ferron et al., 1999; Kulig et al., 2003; Pate et al., 2000) has shown that those engaging in regular physical activity were less likely to smoke, consume alcoholic drinks, or abuse substances. In this study, smoking and drinking behaviours had significant negative associations with physical activity engagement in the univariate model, but the relationships were weak in the multivariate model.

5.4.3 Type of physical activity

For Taiwanese adolescents, physical education lessons seem to have a strong influence on popular types of physical activity, because ball sports and swimming are important topics for physical education in Taiwan. Gordon-Larsen et al. (2000) also found important associations between participation in school physical education with activity patterns of adolescents in their study. In other Asian countries such as Hong Kong and Japan (Hong Kong Sports Development Board, 2001; Sasakawa Sports Foundation, 2002), ball sports remained the most popular physical activity (Table 18). Differences among countries were also noticed. Track and field (athletics) was popular only in Hong Kong; cycling was not in the Japanese top ten; mountain climbing and stair climbing were preferred by Taiwanese. Japanese girls played rope skipping and Taiwanese girls played hoola hoop, which might due to body image concerns (e.g. using hoola hoop to try and achieve a smaller waist).

Table 18: Physical activity preferences in various countries

Ranking	Taiwan (Sample size = total 2235; age 12-18)		Japan (Sasakawa Sports Foundation, 2002) (Sample size = total 1800; age 10-19)		Hong Kong (Hong Kong Sports Development Board, 2001) (Sample size = total 856; age 5-14)	
	Boys (N=937)	Girls (N=810)	Boys (N=622)	Girls (N=559)	Boys	Girls
1	Ball sports	Ball sports	Soccer	Badminton	Basketball	Swimming
2	Cycling	Jogging	Baseball	Volleyball	Swimming	Badminton
3	Jogging	Cycling	Basketball	Basketball	Soccer	Jogging
4	Gymnastics	Gymnastics	Muscular strength training	Walking	Table tennis	Cycling
5	Swimming	Swimming	Swimming	Swimming	Badminton	Dancing
6	Mountain climbing	Hoola hoop	Jogging/running	Rope skipping	Jogging	Basketball
7	Stair climbing	Aerobic dance	Table tennis	Jogging/running	Cycling	Volleyball
8	Others	Stair climbing	Bowling	Soft tennis	Track and field	Callisthenics
9	Weight lifting	Mountain climbing	Volleyball	Bowling	Taekwondo	Track and field
10	Aerobic dance	Walking	Badminton	Muscular strength training	Hiking	Table tennis

5.4.4 Weight control behaviour

The prevalence of trying to lose weight among Taiwanese adolescents (10% in boys and 19% in girls) is lower than that found in the US (30% in boys and 62% in girls) (Department of Health and Human Services Centers for Disease Control and Prevention, 2006) and the UK (18% in boys and 31% in girls) (UK Department of Health, 2003). Most Taiwanese adolescents used healthy methods (i.e. exercise or a reducing fat and calorie intake) to control weight. The unhealthy weight control methods (i.e. fasting, diet pills, vomiting or laxatives) were less commonly used among Taiwanese adolescents compared with American adolescents (17% in boys and 32% in girls) (Lowry et al., 2002). In addition, smoking is found to be one of the weight control behaviour among adolescent girls in western countries (Camp et al., 1993; Fulkerson et al., 2003; Lowry et al., 2002), whereas very few girls smoked regularly and none reported smoking as a weight control method in this study. It seems that smoking is not practiced to lose weight in Taiwan, which is also in accord with previous research among Taiwanese college students (Wong et al., 1999). However, it is concerning that the unhealthy weight control methods increased with age, especially among the 15-18-year girls (14%). The use of unhealthy weight control methods by adolescents has been linked to various high-risk behaviours, for instance delinquent behaviours, substance abuse and serious physical problems (Neumark-Sztainer & Hannan, 2000; Neumark-Sztainer et al., 1996; Shisslak et al., 2006) . Therefore, it is important to educate this subgroup particularity about the potential health risks related to these unhealthy weight-control methods.

Limitations

Limitations imposed by the physical activity measurement should be borne in mind when considering the results presented in this study. Societies construct and understand physical activity in different ways. Westernised countries tend to address

overall or composite physical activity (Craig et al., 2003; UK Department of Health, 2003). Several forms of activity such as household and yard work activities, occupational activity, and self-powered transport (i.e. walking to work or school) are excluded within surveys in Taiwan. Moreover, questionnaires in different countries examined activities for different time periods, for example during the last 7 days in the US (Department of Health and Human Services Centers for Disease Control and Prevention, 2004) and UK (UK Department of Health, 2003), through 2 weeks in Taiwan to 1 year in Japan (Sasakawa Sports Foundation, 2002). These differences make for difficult cross-country comparisons.

Despite these limitations, the findings suggest that there are high-risk groups for high sedentary and low physical activity levels among Taiwanese. Physical inactivity is likely to be contributing to poor health in Taiwanese adolescents as with adolescents in many westernized countries. It seems that high cultural values for academic achievement, that is reflected in study habits and restricted time opportunity for engagement in recreational physical activity may be at least a partial explanation.

5.5 Conclusion

Overall, the percentage of Taiwanese adolescents meeting recommended amounts of physical activity for health is low. Similar to most other countries, Taiwanese girls in the 15-18-age range were the least active group. Factors associated with low activity include both demographic and health behaviour variables. Adolescents living in rural regions, and non-students were at high risk of being physically inactive. Although the prevalence of unhealthy behaviours was low compared with the US and UK, almost half of regular smokers or drinkers reported being physically inactive. These main findings will be published in due course (in press).

With the high amount of inactivity in Taiwanese adolescents, these results should raise concern regarding the state of health of this population. In addition, these data may also provide a baseline for future comparisons and preliminary identification of

groups at higher risk of low physical activity. Older adolescent girls had the lowest obesity prevalence as revealed in study 1 (Chapter 4) but they were the least active and reported the highest proportion of trying to lose weight in this study. This suggests that older girls might be more aware of the thin ideal and attempt to control their weight, resulting in lower obesity prevalence. Physical activity is not widely used for weight loss, leading to low prevalence of activity among this subgroup. Therefore, the following study, outlined in Chapter 6, looks at the issues of body image related to obesity, physical activity and weight control behaviour.

CHAPTER 6 Study 3: Body dissatisfaction among Taiwanese adolescents

6.1 Introduction

Researchers have pointed out that body weight and shape concerns are more pronounced during adolescence (Striegel-Moore & Franko, 2002). The percentage of adolescent girls who would like to be thinner are estimated to be between 50% and 80% in some developed countries (Levine et al., 2002). However, the desire for thinness exists in the context of an increasing prevalence of overweight and obesity. Several studies have demonstrated that many adolescents display concerns about becoming overweight/obese, report dissatisfaction with their body, and also engage in weight loss behaviours (Lee et al., 2004; Lee & Lee, 2000; Levine et al., 2002; Lowry et al., 2002; Presnell et al., 2004). A link has been established between body dissatisfaction and various mental health problems and unhealthy behaviours such as low self-esteem, anxiety, depression, smoking initiation, and the development of eating disorders (Kostanski & Gullone, 1998; Rukavina & Pokrajac-Bulian, 2006; Siegel et al., 1999; Stice & Shaw, 2003). In light of these results, how the issues of obesity and thin ideal are perceived and processed psychologically by adolescents and how they act on these issues need to be better understood. This might help to prevent the development of or reduce existing body dissatisfaction and perhaps diminish the potentially dangerous consequences.

Research, as reviewed in Chapter 2, has looked at factors associated with body dissatisfaction among adolescents. A wide range of biological, psychological and socio-cultural factors have emerged as potential contributors to body dissatisfaction. (Barker & Galambos, 2003; Jones et al., 2004; Presnell et al., 2004; Ricciardelli & McCabe, 2001b; Stice & Whitenton, 2002). Age, BMI, and gender are biological factors related to body dissatisfaction among adolescents. Body dissatisfaction becomes more pronounced with increasing age during adolescence (Rosenblum et al., 1999) and higher BMI has been found to be associated with lower satisfaction with weight (Fung et al., 2003). Girls are more dissatisfied with their bodies than boys

(Baranowksi et al., 2003; Presnell et al., 2004) and girls have reported body dissatisfaction regardless of actual body weight, whereas boys become concerned when they are actually overweight (Field et al., 2001). Additionally, psychological factors (self-esteem and perfectionism) have been shown to be associated with body dissatisfaction among adolescents, with low self-esteem and high perfectionism being correlated with high body dissatisfaction (Ruggiero et al., 2003; Tiggemann, 2005). The awareness and internalisation of socio-cultural ideals might also foster body dissatisfaction, as these ideals are difficult to achieve for most boys and girls (Presnell et al., 2004; Thompson & Stice, 2001). Moreover, body image is likely to be enhanced by physical activity that might influence weight control attitudes and behaviours (Baker et al., 2000).

Whereas studies have provided support for the relationship between these factors and body dissatisfaction among adolescents, particularly for girls, the overwhelming research has been produced with samples of white Caucasian populations. Levels and determinants of body dissatisfaction are likely to vary by ethnicity since socio-cultural factors are key to understanding the development of body image (Smolak, 2004). Despite the evidence that the prevalence of overweight and obesity is increasing and body dissatisfaction is prevalent among Taiwanese adolescents, little is known about the relevant factors associated with body dissatisfaction for Taiwanese adolescents. Two Taiwanese studies illustrated that 65.5% of girls aged 11-14 wanted to be thinner and only a small proportion of high school girls (13.2%) and boys (22.0%) reported being satisfied with their weight (Page et al., 2005; Wong et al., 2000). The findings from this research (Chapter 4 and 5) revealed a rising incidence of overweight and obesity among Taiwanese adolescents and have also shown differences between boys and girls in levels of obesity, physical activity patterns, and weight control behaviours. Boys and girls might experience different cultural pressure for ideal body shape and adopt different methods to control body weight.

It is not clear whether factors found in the literature, derived largely from European and North American samples, are also salient with Taiwanese adolescents. This study,

therefore, was designed to assess body dissatisfaction and examine the biological (age, BMI and gender), psychosocial (self-esteem, perfectionism, awareness and internalisation of the social ideal), and weight-related factors (weight loss behaviour and physical activity) associated with body dissatisfaction in Taiwanese adolescents. Based on the literature, a conceptual framework has been formed and presented in Figure 18. The following questions were addressed:

1) What is the current prevalence of body dissatisfaction in Taiwanese adolescents?
2) What are the consequences of body dissatisfaction in terms of weight control behaviours and weight loss methods in Taiwanese adolescents?
3) What factors are associated with body dissatisfaction in Taiwanese adolescents?

It was expected that girls would indicate greater body dissatisfaction and engage in more weight loss behaviours than boys. BMI, age, perfectionism, awareness and internalisation of social ideals would be positively related to body dissatisfaction; and self-esteem and physical activity would associate with body dissatisfaction negatively.

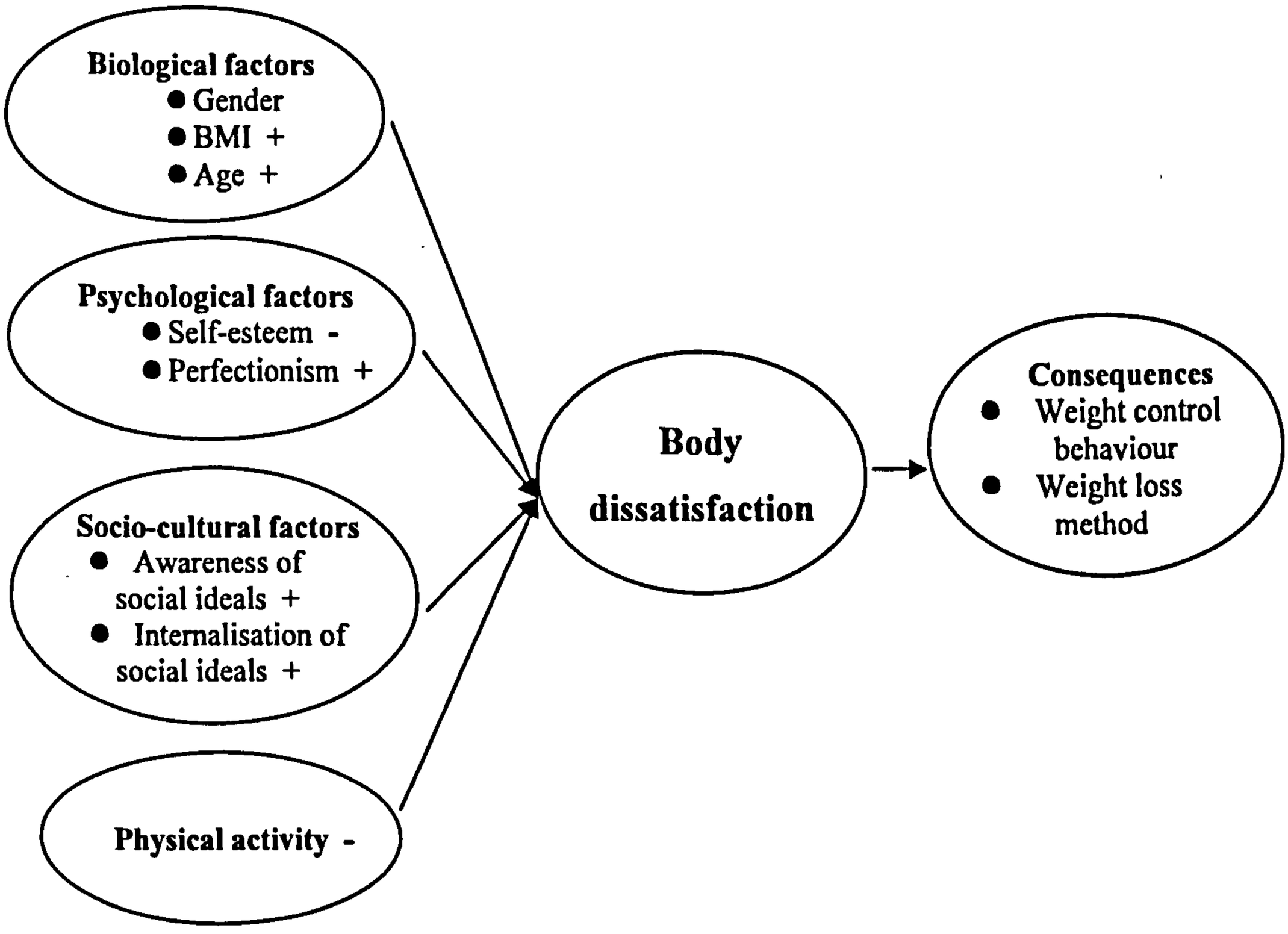

Figure 18: Conceptual framework of factors relevant to body dissatisfaction

Additionally, the present study will also serve as a means of identifying appropriate candidates for follow-up interviews to qualitatively explore adolescents' attitudes toward their body, their perceptions of the ideal body as well as their physical activity and weight control behaviours. This will be the topic of Chapter 7.

6.2 Methods

6.2.1 Participants

Students were recruited as participants for this study from junior high schools in Taipei County, Taiwan. Taiwan is divided into 25 district regions and Taipei County has the largest population among the 25 district regions. In order to recruit a representative sample from Taipei County, participants were selected by multiple-stage sampling in the order of urbanisation, school, and class. The recruitment procedures were as follows:

Stage 1: About 80% of the population in Taipei County live in urban areas and 20% live in rural areas. Hence, for this study four cities representing urban areas and one township representing a rural area were randomly selected to reflect the population distribution.

Stage 2: One school in each city and township were randomly selected (total five schools).

Stage 3: Two classes in each grade (grade 7-9) and school were randomly selected (total six classes in each school).

Following this, the researcher contacted the superintendent of the Education Bureau in Taipei County who helped to make contact with the head-teachers of selected schools. Then, the researcher phoned and met the head-teachers of schools to explain the purposes and procedures of the study.

All students in the selected classes were invited to take part in this study. Prior to data collection, information letters outlining the purpose of the study and consent forms were sent to the students and their parents/guardians of the selected classes at five

schools in Taipei County. In total, 1208 questionnaires were sent to the schools. Those who did not return the consent forms (304 students) and did not complete the questionnaire (21 students) were excluded from the study, resulting in a 73.1% participation rate in the study. These were 883 students (452 boys and 431 girls) aged 12-16 and enrolled in grade 7-9. They completed the questionnaire during one class period.

The ethics application for this study was approved by the Department of Exercise and Health Sciences Research Ethics Committee on 20th November 2005 (reference number 05/045) (appendix 1).

6.2.2 Measures

The composite questionnaire in this study consisted of five sections to assess psychological, socio-cultural and demographic variables, weight control behaviour and physical activity.

Selection of measurements

The literature was reviewed to determine the most appropriate variables and instruments. The recommendations made by previous researchers were considered in the selection of measures (Bane, 1998; Thompson, 1990; Thompson, 2004). Other factors considered included:

- The validity and reliability of instruments: the measure correlates at a reasonable level with measures with which it should theoretically relate. A reliability coefficient of .70 is suggested (Thompson, 2004).
- Appropriate samples: A measure that has acquired evidence of validity with many and diverse samples would be considered first. For example, those measures that have been tested on Taiwanese or Chinese samples, especially for adolescents.

- Length of time to complete and complexity: Employing several measures could lead to the participants becoming bored and tired. Therefore, the length and complexity of the instruments were also considered.

Hence, instruments that have evidence of reliability and validity in adolescents, that are short, simple to administer and understand and do not require much effort from the participants were chosen. The selected instruments are presented in Table 19 and outlined below: (see appendix 3 for the English version of each instrument)

Table 19: Selected variables and instruments

Measure	Name of the measurement / variables	Number of items	Chinese version
Psychological variables	Contour Drawing Rating Scale	2	Yes
	Appearance evaluation subscale (MBSRQ)	7	Yes
	Rosenberg Self-esteem Scale	10	Yes
	Perfectionism subscale (EDI)	6	Yes
Sociocultural variables	Internalisation subscale (SATAQ)	8	No
	Awareness subscale (SATAQ)	6	No
Weight control behaviour	Single items from Taiwan National Health Interview Survey	2	Yes
Physical activity	International Physical Activity Questionnaire (IPAQ)	7	Yes
	Single items from Taiwan National Physical Activity Survey	3	Yes
Demographic variables	Age, gender, parents' education and occupation, height, and weight	Single items	

Measures of psychological variables

Figure ratings/silhouettes

The Contour Drawing Rating Scale was used in this study (Thompson & Gray, 1995). This scale is a widely used assessment, consisting of nine male and female figures (1=thinnest; 9=largest) with precisely graduated increments between adjacent sizes (Thompson et al., 1998). It requires participants to locate their current body figure as well as their ideal body figure from the contour drawings of incremental sizes. The difference between the ratings is the 'Self-Ideal Discrepancy' and is considered to be

an indication of body dissatisfaction. Higher Self-Ideal Discrepancy scores illustrate a greater degree of dissatisfaction. Thompson and Gray (Thompson & Gray, 1995) reported that the one-week test-retest reliability with undergraduates was r=.78 and a correlation of r= .71 between self-rating and reported weight and r=.59 between self-rating and BMI. Comparable results were found in participants aged 17-19 (r=.69 in self-rating and weight; r=.77 in self-rating and BMI) (Gillen et al., 2006). The test-retest reliability for self-ideal discrepancy at two weeks was r=.82 with early adolescent girls (Wertheim et al., 2004).

The Multidimensional Body-Self Relations Questionnaire - Appearance Evaluation (MBSRQ-AE)

The MBSRQ (Cash & Pruzinsky, 1990) is one of the most widely used and psychometrically evaluated measures of body image, consisting of subscales which assess different components of body image (Bane, 1998; Thompson et al., 1998). Items are rated on a five-point Likert scale that assess level of agreement from (1) definitely disagree, to (5) definitely agree. One subscale only was used in this study. The Appearance Evaluation subscale has seven items reflecting attitudes towards and satisfaction with overall physical appearance. In contrast to the Self-Ideal Discrepancy, which is a specific measure of body size/weight dissatisfaction (Smith et al., 1999). The Appearance Evaluation subscale provides a global measure of liking and satisfaction with one's looks and attractiveness related to general physical appearance. High scorers feel mostly positive and satisfied with their appearance. Reliability for this subscale in previous research was satisfactory for participants aged 17-19, with Cronbach's alpha of .88 (Gillen et al., 2006). The Chinese version showed good factorial validity and reliability in Taiwanese adolescents. The Cronbach's alpha for the appearance evaluation subscale ranged from .71 to .77 (Lin & Lin, 2000; Wu & Huang, 1999); two-week test-retest was .78 (Wu et al., 1999).

Self-esteem

The Rosenberg Self-Esteem Scale (Rosenberg, 1965) was originally developed for measuring global self-esteem with adolescents. It consists of 10 items, which the respondent is required to rate on a four-point Likert scale ranging from (1) strongly disagree, to (4) strongly agree. In a review of self-esteem measurements, this scale was found to be the most frequently used measure of self-esteem, with the high internal consistency and test-retest reliability contributing to its popularity (Blascovich & Tomaka, 1991). A higher score indicates a higher level of self-esteem. It was also shown to be reliable and valid with adolescent samples across countries in recent studies (Keery et al., 2004; McCabe et al., 2003; Siegel et al., 1999). The Chinese version with a Taiwanese sample showed high reliability with Cronbach's alpha of .90 (Wang, 2001).

Perfectionism

The Perfectionism subscale of the Eating Disorder Inventory was used to assess trait perfectionism (Garner, 1991). It measures the extent to which one believes that only the highest standards of personal performance are acceptable and the belief that outstanding achievement is expected by others (parents and teachers). All statements were rated on a 6-point Likert scale, with higher scores indicating perfectionism (McCabe et al., 2003). Good reliability for this subscale has been reported in previous studies with samples of adolescents, with Cronbach's alphas ranging from .78 to .88 (Keery et al., 2004; McCabe et al., 2003). The Chinese version of perfectionism subscale with Taiwanese adolescents showed that the Cronbach's alpha was .79 in clinical patients; .68 in university female students (Tsai, 2001) and .66 in adolescents (Hsiao & Lin, 1998).

Measures of socio-cultural variables

Socio-cultural Attitudes Towards Appearance Questionnaire (SATAQ)

The SATAQ was used to measure 'level of agreement with dominant, culturally sanctioned societal standards of female appearance mainly related to idealized thinness' (Abrams et al., 2002) (p 445). It consists of two subscales: (1) a six-item Awareness subscale: assessing recognition/awareness of social attitudes about thinness/attractiveness (e.g. most people believe that the thinner you are, the better you look); (2) an eight-item Internalisation subscale: examining the degree of acceptance/internalisation of these beliefs (e.g. I would like to look like the models in the magazines). Responses were scored on a 5-point Likert-type scale ranging from (1) strongly disagree, to (5) strongly agree. High scores on the Awareness subscale indicate familiarity with the socio-cultural ideal whereas the Internalisation subscale taps adoption of that ideal (Smolak et al., 2001).

The SATAQ has adequate internal consistency, replicable factor structure, and good convergent validity with college women (Heinberg et al., 1995). The adolescent version was recently developed with thin-ideal for girls and muscular-ideal for boys (Smolak et al., 2001) and has been used in other research (Jones et al., 2004). The results showed that the adolescent version also has acceptable validity (Jones et al., 2004; Smolak et al., 2001). This study adopted the adolescent version but replaced the magazine titles with popular magazines among Taiwanese adolescents.

Measures of weight control behaviour

Weight control behaviours were examined with the following questions, which were taken from the Taiwan National Health Interview Survey (http://nhis.nhri.org.tw), similar to the US Youth Risk Behavior Surveillance (Department of Health and Human Services Centers for Disease Control and Prevention, 2004): 'Which of the

following are you trying to do about your weight? '. Participants were asked to select one of the 4 options: 'gain weight' 'stay the same weight' 'lose weight' and 'not trying to do anything'. They were also asked about the methods for weight loss (e.g. exercise, eat fewer snacks, fasting, taking medicine, vomiting). The methods were classified into three groups: 'Healthy exercise', 'Healthy diet: ate fewer snacks, food with fewer calories, or low in fat', and ' Unhealthy method: skip meal, fast >24 hours, take medicines (diet pills, laxatives, etc.), or vomit'

Measures of physical activity

Two physical activity measures were used to assess leisure time and overall physical activity.

Leisure time physical activity

Three items were taken from the Taiwan National Physical Activity Survey (Taiwan National Council on Physical Fitness and Sports, 2004). Participants were asked to indicate the number of days in a usual week that they participated in physical activity, excluding compulsory lessons at schools. The average duration of activity on each day and the intensity of breathing required for the activity was assessed. These simple questions had the advantage of having been used extensively with a nationally representative Taiwanese samples and the validity and reproducibility for these physical activity questions have been reported in previous Taiwanese research (Lan et al., 2006). For the correlation or regression analyses, a leisure time physical activity index was calculated in METs/week based on the formula below (Liu & Huang, 1999; Wu et al., 1999):

8 x vigorous minutes (breathing hard) x days + 4 x moderate minutes (breathing slightly hard) x days + 1.5 x light minutes (no change in breathing) x days.

International Physical Activity Questionnaire (IPAQ)

The IPAQ series was designed to be used in studies to assess daily physical activity habits and intended to provide an internationally comparable estimates. The IPAQ instruments have acceptable measurement properties in samples of adults selected from 12 countries (Craig et al., 2003). In adolescents, previous research showed that time spent in each activity reported in the IPAQ was modestly correlated with the 24-hour recall data (Guedes et al., 2005). The IPAQ is available in different languages. A Chinese version has been developed, which required no translation for this study (Liu, 2004). The Chinese version of IPAQ with Taiwanese adults has good concurrent validity (.63-.88) with Global Physical Activity Questionnaire, 7-day recall, and 3-day physical activity log. It also has good criterion validity (.31-.41) assessed against the RT3 accelerometer (Tri-axial research tracker kit) and test-retest reliability within 3 to 21 days (.67-.96) (Liu, 2004). A health survey in Hong Kong employed the IPAQ with adolescent populations (Wong et al., 2004) but did not provide test-retest or validity data. There are four kinds of questionnaire, including telephone or self-administered short and long versions. In this study, the self-administered short version was utilized, which is the most frequently suggested for use with young populations (Guedes et al., 2005). This version is composed of seven questions and provides information with regard to daily activities across life domains (at work, home, transport, or recreation) that require physical effort of moderate-high intensities, walking frequency and duration, time spent sedentary (sitting position). The IPAQ index follows this formula

METs = 8 × vigorous minutes × days + 4 × moderate minutes × days + 3.3 × walking minutes × days (www.ipaq.ki.se).

Demographic variables

A brief demographics questionnaire was developed and administered to each participant for descriptive and categorisation purposes. Variables included age (categorised into early adolescence (age 12-14) and late adolescence (age 15-16)), gender, residential location (urban and rural), self-reported weight and height, and parents' occupation and education. BMI was calculated as weight in kilograms divided by the square of height in meters (kg/m^2). BMI-groups were classified using the age- and gender- specific cut-off points of the IOTF (Cole et al., 2000). As only a small proportion of girls were obese, participants were divided into two BMI-groups (normal/underweight and overweight/obesity) for some analyses. Socio-economic status (SES) was examined by parents' occupation and education based on Hollingshead's 'Two Factor Index of Social Position', modified to fit Taiwanese society by Lin (1994). Parents' occupation and education were both divided into 5 levels and scored from 5 to 1. The SES score was obtained with occupational score × 7 + educational score × 4.

6.2.3 Procedures

Translation

With the exception of the Social Attitudes Towards Appearance Questionnaire, all the selected instruments had already been developed and validated as Chinese versions. The Contour Drawing Rating Scale has been used in Taiwanese adolescent samples, but the translation process, validity and reliability were not reported clearly. Therefore, the first stage of the questionnaire development was forward and backward translation for the Contour Drawing Rating Scale and Social Attitudes Towards Appearance Questionnaire. The two measures were translated from English to Chinese by two independent translators, whose native language is Chinese. One is an assistant professor in a university and has a PhD degree from the UK in a health-related field (translator 1) and the other is the researcher (translator 2). One agreed

upon translated version was completed after discussions. Two teachers and five students were also interviewed to examine the use of common language and clarity of the translation. The wording of only a few items was modified. Then, one native-English speaker and professional translator (translator 3) made backward translations (from Chinese to English). The backward translations were compared with the initial English versions. It was discussed by the researcher and two translators (translator 1 and 4). The new translator's native language is Chinese and he also has a PhD degree in education from the UK (translator 4). No change was made since the two English versions showed similar results.

The second stage was to compile the Chinese questionnaire booklet with all the Chinese instruments along with the items assessing demographic variables. The researcher discussed the construction of the questionnaire booklet with the previous two translators (translator 1 and 4) and two advisors. One suggested not putting the title of each measure (e.g. perfectionism, self-esteem) on the overall survey since these titles might prime the students to think about those problems when responding. Based on the discussion, the titles of each measure were deleted and replaced by the instruction: 'please circle one option on how you feel about the statement'. One advisor also pointed out that the Western body figures in the Contour Drawing Rating Scale might raise concerns since there were queries about how appropriate they are for other ethnicities from some researchers (Gardner, 2002; Thompson, 1996; Thompson et al., 1998). Therefore, the researcher interviewed three high school teachers and twenty-three students to evaluate the appropriateness of the body figures for Taiwanese. Two teachers and fifteen students expressed that the original body figures could be regarded as Taiwanese. The teachers explained that the main differences between Western and Taiwanese populations are facial features and the colours of skin and hair, whereas these features were not shown clearly in the figures. However, six students indicated that the figures looked like Western populations. Two students had no opinions. One teacher suggested making the hair black might improve the image. The researcher modified the figures with black hair and showed them to the students again. All the students agreed the figures looked like Taiwanese.

On the basis of comments and responses, the Chinese questionnaire booklet was revised and completed consisting of 58 items in 4 pages (appendix 4).

Pilot study

After the questionnaire was completed, thirty-three students (aged 12-13) participated in a pilot study to evaluate the clarity and construction of the questionnaire again. The procedure for conducting the questionnaire and the length of time for completing the questionnaire were also tested. After students completed the questionnaire, they were interviewed about the difficulties of questionnaire completion. It took about 10-15 minutes to complete. Overall, students indicated that the language was suitable and the questions were quite easy to answer. Therefore, no change was made after the pilot study.

Test-retest

A sample of 30-50 for evaluating test-retest reliability was suggested (Thompson, 2004). Therefore, forty-three students aged 12-13 in one class (grade 7) were recruited to take part in the test-retest survey over a two-week period, of which 33 participants completed the questionnaire booklet at both time points.

6.2.4 Data treatment and analyses

There were very few missing data in each variable (range from 0% - 1.1% of the sample), except the IPAQ (which is discussed later in page 126). The potential outliers were also examined with cases having standardized scores in excess of 3.29 (Chen et al., 2006; Field, 2005). Outliers were only found for BMI (2 cases), MBSRQ-AE (4 cases) and self-esteem (1 case). The incidence of outliers was not greater than 0.5% for these variables. After double-checking the original data, it was considered these values as 'real' events. Then, the following analyses were conducted sequentially:

1. The first stage of analysis was to examine the descriptive statistics of the variables, showing the numbers of participants, BMI, and overweight/obesity prevalence. Differences in the percentages of overweight/obesity prevalence by gender and age group were assessed for significance with z tests.

2. The psychometric properties of the instruments were then examined. Exploratory factor analyses were used to test the factorial validity of the Social Attitudes Towards Appearance Questionnaire (SATAQ-Awareness and SATAQ-Internalisation subscales). The internal consistency of each scale and subscale for each measure was tested using Cronbach's alpha. The test-retest reliability was assessed with Intraclass correlation (ICC) providing the absolute agreement for measurements over a two-week period.

3. Analyses of variance (ANOVA) were then performed to test differences and interactions for self-rating, ideal rating and body dissatisfaction using gender, BMI-group, and age group as independent variables. Differences in the percentages of self-ideal discrepancy (prevalence of body dissatisfaction) between genders, BMI-groups, or age groups were assessed for significance with z tests.

4. Differences in the percentages of weight control behaviour and weight loss method between genders, BMI-groups, or age groups were tested using z tests.

5. Finally, bivariate associations were assessed for each gender between body dissatisfaction and other measures using Pearson correlations. Then, multiple regression analyses were performed to identify predictors of body dissatisfaction separately by gender. In each regression analysis, the dependent variable was body dissatisfaction. The independent variables were those that showed significant associations with body dissatisfaction from Pearson correlation analyses ($p<.05$).

6.3 Results

6.3.1 Descriptive statistics

Table 20 shows numbers of participant, means of SES, weight, height, BMI, and the prevalence of overweight and obesity by gender and age group. Gender differences were found in weight, height, BMI, overweight and obesity prevalence, with boys having the greater value or percentage (all $p<.001$). Among age groups, significant differences were only found in weight and height between early and old adolescent boys ($p<.001$). The overweight and obesity prevalence was higher in young adolescents than in old adolescents for both genders, but did not reach statistical significance. Overall, the results illustrated that 34.7% of Taiwanese boys and 16% of girls were either overweight or obese, according to the classification of overweight and obesity by the IOTF (Cole et al., 2000).

Table 20: Descriptive statistics for weight, height and BMI by gender and age group

	N	SES (mean)	Weight (kg)	Height (cm)	BMI (kg/m^2)	Overweight/obesity prevalence (%)		
						Overweight	Obese	Overweight/ obese
Boys	452	27.7	55.7	162.1	21.0	25.2	9.5	34.7
12-14	362	27.6	54.1	160.4	20.9	25.6	10.1	35.7
15-16	90	28.0	62.3	169.1	21.7	23.9	6.8	30.7
p [a]		*.746*	*<.001*	*<.001*	*.108*	*.370*	*.169*	*.186*
Girls	431	27.7	49.1	156.7	19.9	13.2	2.8	16.0
12-14	340	28.1	48.7	156.5	19.8	13.7	3.3	17.0
15-16	91	26.2	50.6	157.7	20.3	11.1	1.1	12.2
p [a]		*.054*	*.126*	*.088*	*.330*	*.257*	*.131*	*.134*
p [b]		*.979*	*<.001*	*<.001*	*<.001*	*<.001*	*<.001*	*<.001*

[a:] Differences between age groups; [b:] Differences between genders

Compared with the findings of overweight/obesity prevalence in study 1 with nationally representative samples and measured weight and height, similar patterns were found in this study (Figure 19). Boys and early adolescents showed a higher prevalence of overweight and obesity. Although the difference between age groups was not statistically significant, it might be due to the small age-range for the old adolescents in this study (this study: age-range 15-16; study 1: age-range 15-18). Therefore, the results of overweight/obesity prevalence in this study with self-report

weight and height might suggest that they are a reasonably representative sample of the overall national population regarding weight related issues. Additionally, the prevalence of overweight/obesity was significantly higher in boys than in girls across three surveys (also Figure 27 in Chapter 8, p184).

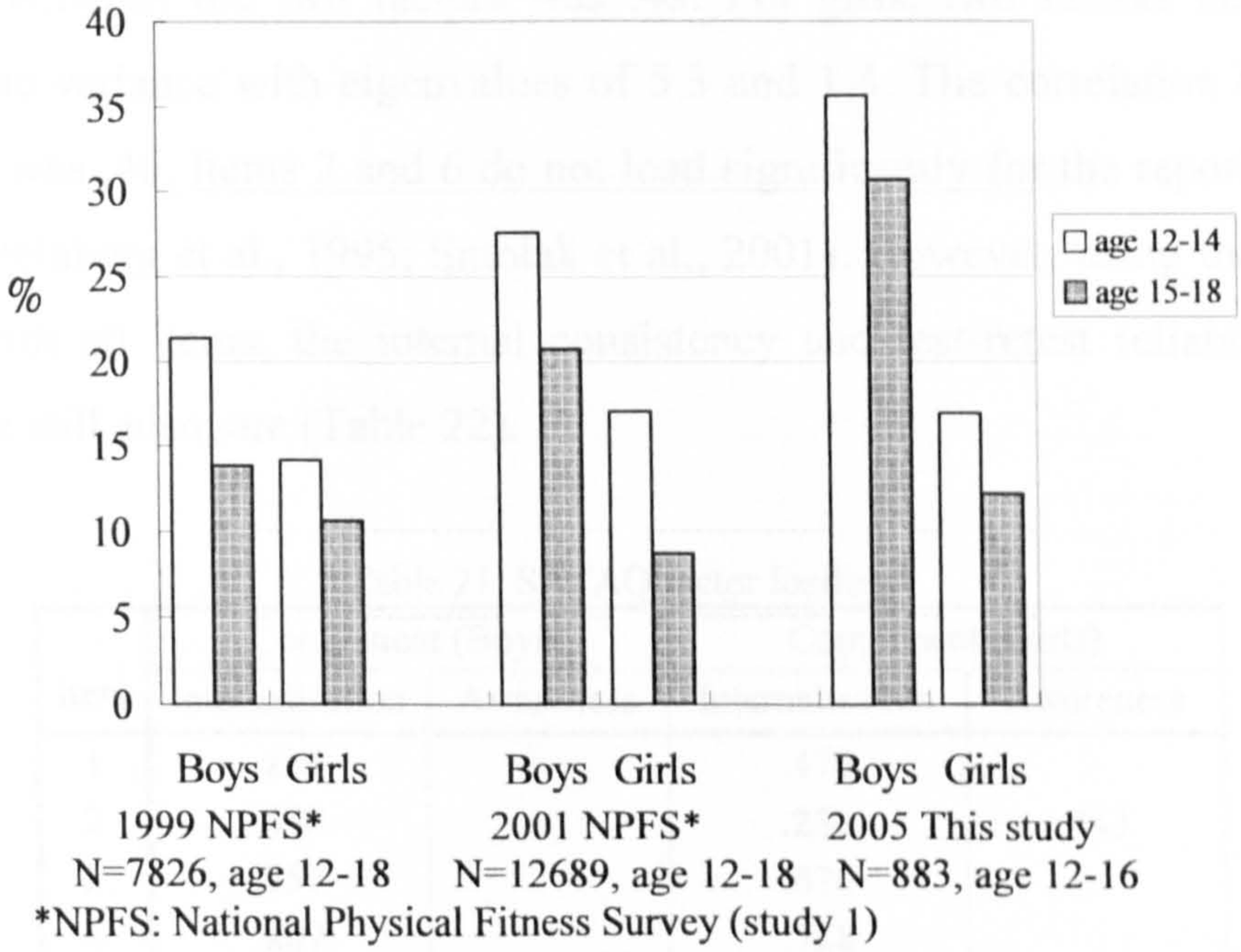

Figure 19: Prevalence of overweight/obesity in three surveys from 1999 to 2005

6.3.2 Validity and reliability of the Chinese versions of instruments

Validity

The validity of the Chinese version of the Contour Drawing Rating Scale (Ku, 2003) has not been previously reported. In this study, the validity of the figures was assessed by examining the correspondence between an individual's reported weight and current self-rating (Patel & Gray, 2001). The current figure choices were strongly correlated with reported weight (Pearson correlation: .74 in boys and .75 in girls, respectively).

There is no validated Chinese version of the SATAQ. To verify the factor structure of the scales, principal component factor analyses were conducted separately for boys

and girls. Direct oblimin rotation was used because correlations are expected among factors. Factor loadings above .4 were retained in the analyses. The results showed that two factors were extracted (internalisation/awareness) in both genders, in spite of 2 items with low loadings (Table 21). For boys, two factors accounted for 45.2% of the variance with eigenvalues of 5.0 and 1.3. Items 1 and 6 had low loadings. The correlation between the two factors was .49. For girls, two factors accounted for 48.0% of the variance with eigenvalues of 5.3 and 1.4. The correlation between the two factors was .46. Items 2 and 6 do not load significantly for the reported factorial structure (Heinberg et al., 1995; Smolak et al., 2001). However, using the two-factor structure with all items, the internal consistency and test-retest reliability in each subscale are still adequate (Table 22).

Table 21: SATAQ factor loadings

Item	Component (Boys)		Component (Girls)	
	Internalisation	Awareness	Internalisation	Awareness
1	**.229**		**.470**	
2	.498		**.250**	.443
3	.757		.676	
4	.807		.728	
5	.669		.742	
7	.701		.640	
13	.713		.676	
14	.685		.716	
6		**.389**		**.320**
8		.817		.640
9		.621		.539
10		.504		.816
11		.533		.781
12		.787		.720

Extraction: Principal Component Analysis; Rotation: Oblimin with Kaiser Normalization.

Reliability

The reliability was assessed with Cronbach's alpha for internal consistency and with Intraclass correlation (ICC) for test-retest reliability over a two-week period. The results are presented in Table 22.

Overall, the results showed that the structure of the Chinese version for each instrument seems to be adequate for Taiwanese adolescents except for the IPAQ. The Cronbach's alpha coefficients of five instruments all exceeded or were close to the recommended level .70 (Nunnally & Bernstein, 1994; Westergaard et al., 1989). These revealed that the internal consistency of each instrument was satisfaction. With regard to the stability reliability, ICC above .75 is thought to be excellent and within the range of .40 to .75 is classified as fair to good (Fleiss, 1981). Therefore, except the IPAQ, the ICCs of all instruments ranging from .64 to .95 indicated good test-retest reliability.

Table 22: Reliability of each instrument

Instruments	Boys		Girls	
	Cronbach's alpha	ICC	Cronbach's alpha	ICC
Contour Drawing Rating Scale		.75		.91
MBSRQ-Appearance evaluation	.71	.89	.77	.68
Self-esteem	.73	.84	.78	.73
EDI-Perfectionism	.63	.72	.68	.76
SATAQ-Awareness	.73	.64	.76	.82
SATAQ-Internalisation	.82	.85	.84	.72
Leisure physical activity	.92		.95	
IPAQ	.46		.63	

After the preliminary analyses, it was decided to exclude the IPAQ in the final data analyses. Only the leisure time physical activity was used for reporting physical activity behaviour. The reasons are: 1) The missing values for each item for the IPAQ were high ranging from 17.4% to 63.6%. This suggested that daily physical activities might not be easy to recall for adolescents. 2) The test-retest value for the IPAQ was low in this survey. One of the reasons might be that the questions asked about the physical activity behaviour in the last 7 days, whereas the questionnaires were administered at two different times for 14 days. 3) The test-retest reliability was better for the leisure physical activity measure in this survey. 4) The leisure physical activity measure has been widely used in Taiwanese national surveys for many years and it was used in a previous physical activity study (study 2) so that comparisons could be made.

6.3.3 Perceptions of self and ideal body and body dissatisfaction

The discrepancy between self and ideal ratings from the Contour Drawing Rating Scale is the indication of body dissatisfaction (body weight/size dissatisfaction). The results of three-way ANOVAs examining the differences and interactions on these weight-related self-perceptions by gender, BMI-group, and age group are presented in Table 23, Figure 20, 21 and 22. The prevalence of body dissatisfaction is shown in Table 24.

Differences and interactions on self-rating, ideal rating and body dissatisfaction between gender, BMI-group and age group

The findings from ANOVAs revealed that boys reported a bigger shape for self-rating, desired a bigger shape, and showed lower body dissatisfaction than girls significantly. On average, boys and girls wanted to be 0.4 and 1.4 body sizes smaller than their current self-perceived image. The overweight/obese individuals reported significantly bigger self-rated shape, larger ideal-rated shape, and greater body dissatisfaction than the normal/underweight group. The old adolescents demonstrated a bigger shape in self-rating and higher body dissatisfaction than the young group, whereas no significant difference was found in the ideal rating between age groups.

Significant interactions were found in body dissatisfaction between gender and BMI-group, gender and age group, and BMI-group and age group. The results illustrated that the overweight/obese individuals were more dissatisfied with their bodies than the normal/underweight group with greater differences in girls. The older adolescents reported higher body dissatisfaction than the young group with greater differences in girls. These findings might be explained by the higher prevalence of body dissatisfaction in the girls when compared to the boys. Additionally, the overweight/obese group had a higher prevalence of body dissatisfaction than the normal/underweight group with greater differences in older adolescents. The difference in body dissatisfaction between overweight/obese and normal/underweight

individuals therefore increases with age. There was no significant interaction between groups in either self-rating or ideal rating.

Prevalence of body dissatisfaction

Examination of the source of body dissatisfaction revealed that almost half of boys and three fourths of girls expressed a desire to be thinner. Only 17.7% of boys and 16.3% of girls illustrated that they were satisfied with their body by circling the same figure for the self perceived image and ideal image. There were also about one third of boys and one out of ten girls wishing to be bigger. Significant differences were found between genders, with more girls wanting to be thinner than boys and more boys wanting to be bigger than girls (Table 24).

Around 93% of the overweight/obese boys and all the overweight/obese girls would like to be thinner. Although the normal/underweight adolescents were found to be more satisfied with their body than the overweight/obese adolescents in both genders, only approximately 20% of both normal/underweight boys and girls reported body satisfaction. The majority of the normal/underweight girls (68.2%) still desired to be thinner. Among the normal/underweight boys, 26.9 % of them wanted to be thinner and 49.3% of them wanted to be bigger. Overall, more overweight/obese adolescents wanted to be thinner and the overweight/obese adolescents showed lower prevalence of body satisfaction than the normal/underweight group for both genders.

No significant difference in the prevalence of body dissatisfaction between age groups for both genders.

Table 23: Results of ANOVA in self-rating, ideal rating and body dissatisfaction by gender, BMI-group and age group

		N	Self-rating		Ideal rating		Body dissatisfaction [b]	
			Mean (SD[a])	F (sig)	Mean (SD[a])	F (sig)	Mean (SD[a])	F (sig)
Gender				47.17***		713.36***		62.02***
	Boys	443	5.2 (1.71)		4.8 (0.81)		1.4 (1.24)	
	Girls	423	3.6 (1.68)		2.2 (0.92)		1.6 (0.98)	
BMI-group				363.78***		27.58***		144.40***
	Overweight/obese	221	6.5 (1.19)		4.3 (1.33)		2.2 (1.14)	
	Normal/underweight	645	3.7 (1.50)		3.3 (1.56)		1.2 (1.01)	
Age group				11.48**		.25		17.47***
	Age 12-14	688	4.3 (1.87)		3.6 (1.58)		1.4 (1.07)	
	Age 15-16	178	4.5 (1.90)		3.5 (1.54)		1.7 (1.29)	
Gender*BMI-group				.354		2.55		26.39***
Gender*age group				2.76		.58		9.88**
BMI-group*age group				2.69		.29		5.05*
Gender*BMI-group*age group				.135		1.74		1.75

[a] SD: Standard Deviation [b]: Absolute value of self and ideal ratings is the indication of body dissatisfaction; the greater values mean greater dissatisfaction

Table 24: Differences in Self-Ideal discrepancy (prevalence of body dissatisfaction) by gender, BMI-group, and age group

Measure	Gender			Boys			Girls			Boys			Girls		
	Boys	Girls	p [d]	Normal/ underweight	Overweight / obese	p [e]	Normal/ underweight	Overweight/ obese	p [e]	Age 12-14	Age 15-16	p [f]	Age 12-14	Age 15-16	p [f]
Self-Ideal discrepancy															
Want to be thinner [a]	49.7%	73.7%	*<.001*	26.9%	92.8%	*<.001*	68.2%	100%	*<.001*	49.3%	51.1%	*.380*	72.2%	79.1%	*.092*
Satisfied [b]	17.7%	16.3%	*.29*	23.8%	6.5%	*<.001*	19.7%	0%	*<.001*	18.6%	14.4%	*.175*	17.5%	12.1%	*.108*
Want to be bigger [c]	32.6%	10.1%	*<.001*	49.3%	0.7%	*<.001*	12.1%	0%	*.001*	32.1%	34.4%	*.338*	10.4%	8.8%	*.326*

[a]: Self rating > Ideal rating; [b]: Self rating = Ideal rating; [c]: Self rating < Ideal rating;
[d]: Differences between genders; [e]: Differences between BMI-groups; [f]: Differences between age groups.

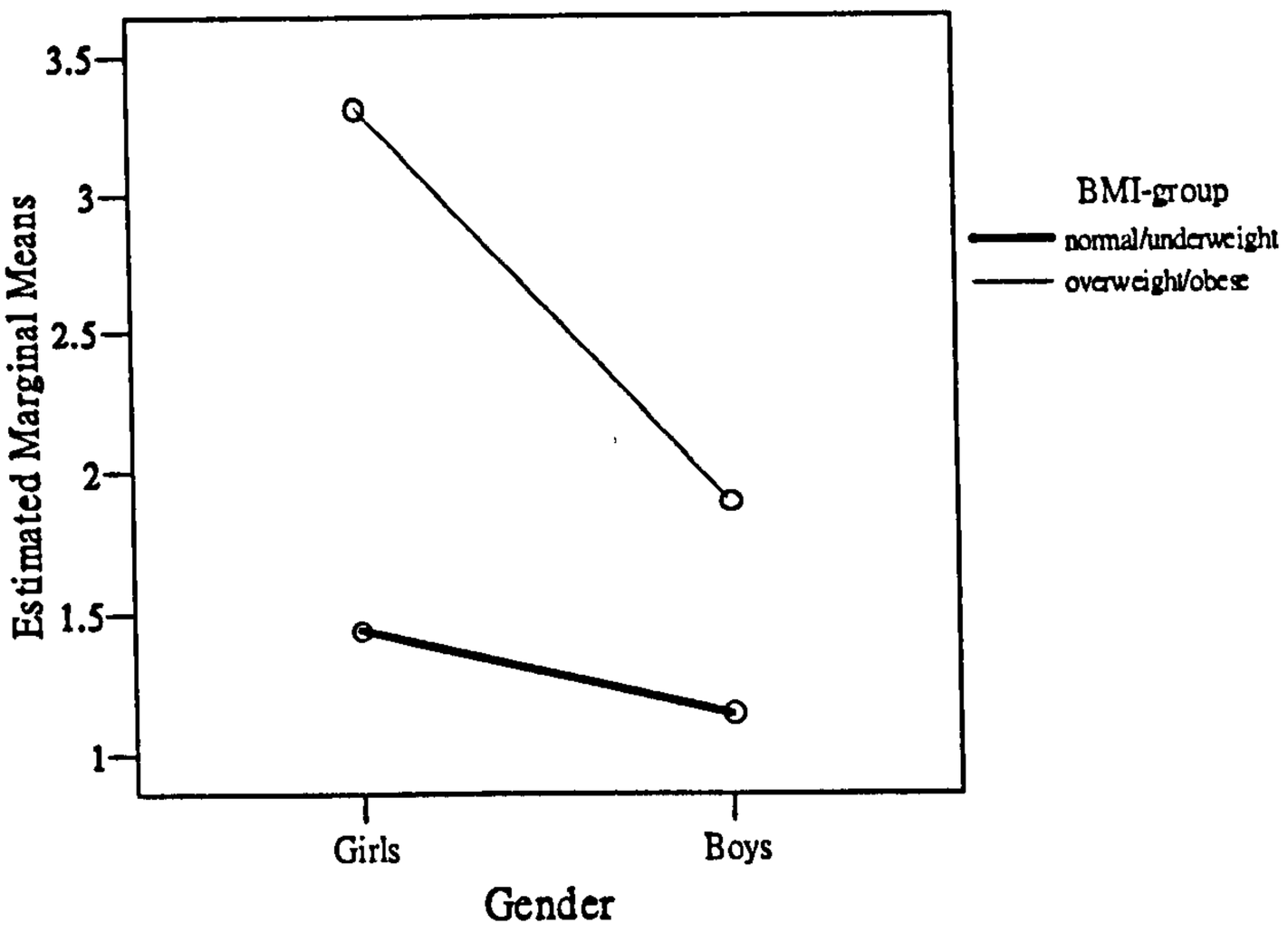

Figure 20: Interaction for body dissatisfaction between gender and BMI-group

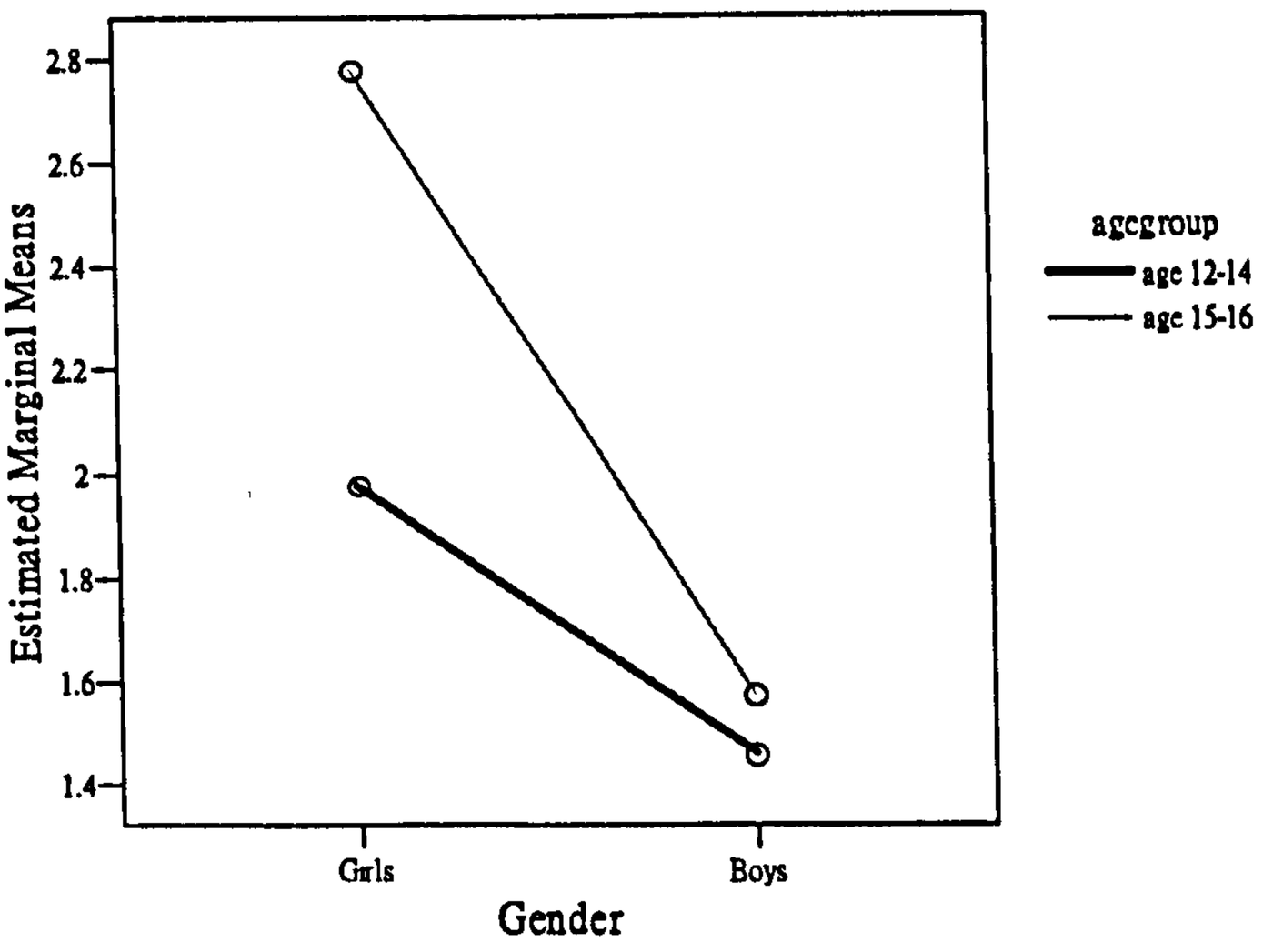

Figure 21: Interaction for body dissatisfaction between gender and age group

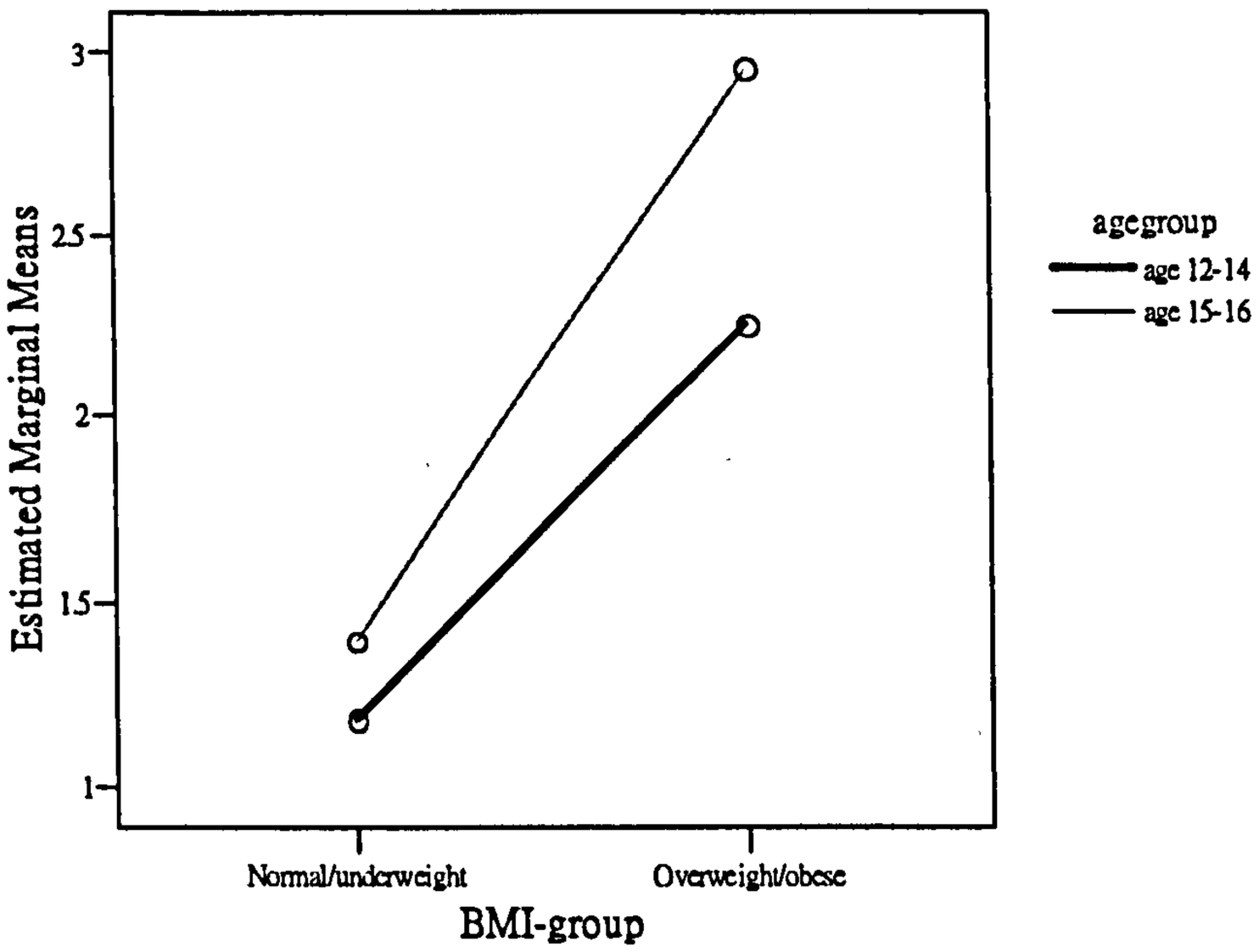

Figure 22: Interaction for body dissatisfaction between BMI-group and age group

6.3.4 Weight control behaviour and weight loss method

This element aimed to address the consequences of body dissatisfaction in terms of weight management behaviours adopted by Taiwanese adolescents. These were compared for gender differences; then, differences in BMI-groups and age groups were also examined separately by gender (Table 25).

More girls than boys were trying to lose weight (27.7% and 16.2%, respectively), even though boys were more overweight or obese than girls. Despite the great desire to be thinner among overweight/obese adolescents, the proportion trying to lose weight was about 30% in overweight/obese boys and just over half in overweight/obese girls.

Frequencies of the unhealthy weight loss methods were higher in boys than those in girls, whereas the proportion was small (11.9% in boys and 8.1% in girls, respectively). Among boys, the overweight/obese group engaged in more unhealthy methods than the normal/underweight group. Among girls, there was no difference between the overweight/obese and normal/underweight groups; however, a

significant difference was found between age groups, showing older girls engaged in more unhealthy weight loss methods than young girls.

6.3.5 Differences in psychological and socio-cultural factors between genders, BMI-groups, or age groups

This stage attempts to examine the differences in psychological and socio-cultural variables between genders, BMI-groups, or age groups. A summary of the results is presented in Table 26.

Girls scored significantly higher on SATAQ-Awareness and SATAQ-Internalisation, but lower on MBSRQ-AE. These suggested that girls felt less positive with their overall appearance and more recognised and endorsed the social standards of appearance. Consistent with the previous findings in study 2 (Chapter 5), girls had lower score in leisure PA than boys, indicating girls were less active than boys.

There was no significant difference in psychological factors (self-esteem and perfectionism) between genders or between age groups. The only significant difference was found in self-esteem between BMI-groups, revealing the overweight/obese group reported lower self-esteem than the normal/underweight group in both genders. The overweight/obese group were also less positive with their overall appearance than the normal/underweight group in both genders.

Among girls, the overweight/obese group reported higher awareness and internalisation of social ideals of appearance than the normal/underweight group. The older girls also showed higher internalisation than the young girls, while this is not true in boys.

Table 25: Differences in weight control behaviour and weight loss method by gender, BMI-group, and age group

Measure	Gender			Boys			Girls			Boys			Girls		
	Boys	Girls	p^c	Normal/ underweight	Overweight / obese	p^d	Normal/ underweight	Overweight/ obese	p^d	Age 12-14	Age 15-16	p^e	Age 12-14	Age 15-16	p^e
Weight control behaviour															
Lose weight	16.2%	27.7%	*<.001*	9.1%	29.6%	*<.001*	23.3%	51.5%	*<.001*	14.9%	21.3%	*.070*	26.0%	34.1%	*.063*
Gain weight	10.1%	4.7%	*.001*	14.0%	2.6%	*<.001*	5.6%	0%	*.023*	10.4%	9.0%	*.347*	4.7%	4.4%	*.452*
Maintain weight	42.7%	41.7%	*.382*	41.4%	46.1%	*.171*	43.3%	33.8%	*.073*	43.5%	39.3%	*.235*	42.0%	40.7%	*.412*
Not control	31.0%	25.9%	*.046*	35.4%	21.7%	*.001*	27.8%	14.7%	*.012*	31.2%	30.3%	*.434*	27.2%	20.9%	*.111*
Weight loss method															
Healthy Exercise	54.2%	46.6%	*.012*	64.7%	47.9%	*<.001*	48.2%	43.1%	*.220*	53.9%	55.4%	*.399*	47.6%	43.9%	*.265*
Healthy Diet [a]	33.9%	45.3%	*<.001*	28.2%	37.6%	*.021*	43.3%	50.5%	*.137*	34.2%	32.5%	*.380*	45.8%	43.9%	*.373*
Unhealthy method [b]	11.9%	8.1%	*.030*	7.0%	14.5%	*.005*	8.5%	6.4%	*.281*	11.9%	12.0%	*.490*	6.7%	12.3%	*.039*

[a]: Including ate fewer snacks, food with fewer calories or low in fat;
[b]: Including fasting >24 hours, taking diet pills, taking laxatives or vomit;
[c]: Differences between genders; [d]: Differences between BMI-groups; [e]: Differences between age groups

Table 26: Differences in psychological and socio-cultural factors by gender, BMI-group, and age group

Measure /Mean	Gender			Boys			Girls			Boys			Girls		
	Boys	Girls	p^a	Normal/ underweight	Overweight / obese	p^b	Normal/ underweight	Overweight/ obese	p^b	Age 12-14	Age 15-16	p^c	Age 12-14	Age 15-16	p^c
MBSRQ-AE	2.9	2.7	*.001*	3.0	2.7	*<.001*	2.8	2.4	*<.001*	2.9	2.9	*.400*	2.8	2.7	*.159*
Self-esteem	24.0	23.9	*.475*	24.3	23.5	*.031*	24.1	22.7	*.003*	24.1	23.7	*.344*	23.9	23.7	*.639*
Perfectionism	6.8	6.5	*.179*	6.7	7.0	*.338*	6.5	6.3	*.792*	6.8	6.7	*.858*	6.6	6.0	*.197*
SATAQ-Internalisation	21.6	24.4	*<.001*	21.4	21.9	*.286*	24.0	26.3	*.001*	21.5	21.9	*.553*	24.1	25.6	*.012*
SATAQ-Awareness	17.5	19.0	*<.001*	17.6	17.4	*.783*	18.7	20.3	*.003*	17.5	17.6	*.938*	18.8	19.6	*.112*
Leisure PA	1286.4	611.1	*<.001*	1257.4	1355.5	*.570*	572.7	864.3	*.019*	1171.5	1765.3	*.022*	625.9	543.3	*.476*

[a]: Differences between genders; [b]: Differences between BMI-groups; [c]: Differences between age groups

6.3.6 Correlations and predictors of body dissatisfaction

These analyses were conducted to estimate the associations between body dissatisfaction and other variables. The correlation matrixes of the variables are presented in Table 27 for boys and Table 28 for girls. Results of the multiple linear regression analyses are shown in Table 29.

Associations between body dissatisfaction and other variables

Although numerous correlations are statistically significant, several are particularly noteworthy. Four variables were found to be associated with body dissatisfaction in boys, including BMI, MBSRQ-AE, self-esteem and SATAQ-Internalisation. Among girls, all variables, except perfectionism, were associated with body dissatisfaction. Higher body dissatisfaction was associated with higher BMI, lower MBSRQ-AE, lower self-esteem, and higher SATAQ-Internalisation in both genders.

Higher BMI was related to higher body dissatisfaction, lower MBSRQ-AE, lower self-esteem, and higher physical activity for both genders. The association between BMI and body dissatisfaction was stronger in girls than in boys (r= .60 in girls and .31 in boys, respectively). Additionally, higher BMI was related to higher SATAQ-Internalisation and SATAQ-Awareness only in girls.

MBSRQ-AE showed a strong positive association with self-esteem for both genders (r= .52 in boys and .56 in girls, respectively). MBSRQ-AE was also related negatively to SATAQ-Internalisation and SATAQ-Awareness in girls.

For both genders, self-esteem was related negatively to BMI, body dissatisfaction, SATAQ-Internalisation and SATAQ-Awareness, while perfectionism was only related positively to SATAQ-Internalisation and SATAQ-Awareness. As expected, there was a strong relationship between SATAQ-Internalisation and SATAQ-Awareness.

Table 27: Correlations among measures for boys

Demographic variables / Measure	1	2	3	4	5	6	7	8	9	10
1. Age	1									
2. SES	.03	1								
3. BMI	.14(**)	.09	1							
4. Body dissatisfaction	.01	-.09	.31(**)	1						
5. MBSRQ_AE	-.02	.02	-.27(**)	-.25(**)	1					
6. Self-esteem	-.10(*)	-.01	-.15(**)	-.15(**)	.52(**)	1				
7. Perfectionism	.03	-.02	.09	.03	.07	.04	1			
8. SATAQ_Internalisation	.04	-.01	.06	.15(**)	.07	-.12(*)	.12(*)	1		
9. SATAQ_Awareness	.07	-.07	.03	.06	.03	-.24(**)	.14(**)	.57(**)	1	
10. Leisure PA	.18(**)	-.02	.16(**)	-.02	.02	-.08	.06	.10	.03	1

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Table 28: Correlations among measures for girls

Demographic variables / Measure	1	2	3	4	5	6	7	8	9	10
1. Age	1									
2. SES	-.09	1								
3. BMI	.14(**)	-.15(**)	1							
4. Body dissatisfaction	.18(**)	-.16(**)	.60(**)	1						
5. MBSRQ_AE	-.11(*)	.16(**)	-.32(**)	-.45(**)	1					
6. Self-esteem	-.03	.18(**)	-.14(**)	-.31(**)	.56(**)	1				
7. Perfectionism	-.04	.08	-.03	.02	.08	.01	1			
8. SATAQ_Internalisation	.15(**)	-.12(*)	.17(**)	.32(**)	-.11(*)	-.16(**)	.21(**)	1		
9. SATAQ_Awareness	.13(**)	-.09	.14(**)	.28(**)	-.12(*)	-.15(**)	.25(**)	.58(**)	1	
10. Leisure PA	-.07	.03	.20(**)	.19(**)	-.12	-.05	.08	.09	.02	1

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Predictors of body dissatisfaction

Simultaneous multiple regression analyses were performed separately for each gender to explore predictors of body dissatisfaction and determine the proportion of variance explained by the variables. Variables were entered into the regression models simultaneously if significant associations were found with body dissatisfaction in Pearson correlation analyses ($p<.05$) (see Table 8). Four variables were entered into the regression model for boys (BMI, MBSRQ-AE, self-esteem, and SATAQ-Internalisation) and eight variables (BMI, MBSRQ-AE, self-esteem, SATAQ-Internalisation, SATAQ-Awareness, age, SES, leisure PA) were entered into the regression model for girls. Results of the regressions for independent variables that were statistically significant are summarised in Table 29.

The findings revealed that BMI, MBSRQ-AE and SATAQ-Internalisation were unique predictors of body dissatisfaction for both genders. A substantial amount of total variance was explained in body dissatisfaction for girls (47%). In contrast, only a modest total amount of variance was explained for boys (14%).

Table 29: Multiple regression analyses for predicting body dissatisfaction

	Adjusted R Square	Unique predictors	β	t (Sig.)
Gender				
Boys	.14	BMI	.25	5.34 (***)
		MBSRQ_AE	-.20	-3.73 (***)
		SATAQ_Internalisation	.15	3.24 (**)
Girls	.47	BMI	.46	8.48 (***)
		MBSRQ_AE	-.21	-3.41 (**)
		SATAQ_Internalisation	.14	2.18 (*)

6.4 Discussion

6.4.1 Prevalence of body dissatisfaction

This study provides further evidence that a high proportion of Taiwanese adolescents want to be thinner. Gender differences in body dissatisfaction are also apparent. This

is in accord with the relatively higher levels of body dissatisfaction among girls than boys found in both Eastern (Lam et al., 2002; Li et al., 2005) and Western studies (Mikkila et al., 2003; Rinderknecht et al., 2002).

Body weight category was strongly associated with body dissatisfaction, with overweight/obese adolescents tending to exhibit greater body dissatisfaction than the normal/underweight individuals for both genders. However, even among those normal/underweight adolescents, less than one quarter of them reported body satisfaction (23.8% in boys and 19.7% in girls, respectively). The majority of the normal/underweight girls still wanted to be thinner, providing evidence that the desire for thinness is widespread among adolescent girls regardless of the actual weight status. The situation with boys, on the other hand, was more complex with some wanting to be thinner and others bigger. These findings suggested that the influences of socio-cultural ideals might play a specific role for both genders. Being too big is undesirable for either boys or girls, whereas being too thin is also unwanted by boys (Kostanski et al., 2004). The results confirm findings from other studies either in UK, Australia, or Netherlands, indicating gender difference in ideal body shape (Baranowksi et al., 2003; Hill et al., 1994; Kostanski et al., 2004; Ter Bogt et al., 2006).

Only a few variables showed differences between age groups for both genders, which might be due to the small sample size and age range, especially for old adolescents. However, in accord with those of McCabe, et al. (2002), older adolescent girls reported higher body dissatisfaction than early adolescent girls in Australia.

6.4.2 Weight control behaviour and weight loss method

This study demonstrated that a high proportion of Taiwanese adolescents wanted to be thinner; nevertheless, only 16.2% of boys and 27.7% of girls were trying to lose weight. Among overweight/obese adolescents, 92.8% of boys and all girls would like to be thinner. However, only 23% of boys and 51.5% of girls reported action to lose

weight. Unhealthy weight loss methods were reported by about 10% of adolescents and increased with age. Although the proportion is small, it still provides cause for concern since unhealthy weight control behaviours have been linked to various risk behaviours among adolescents (e.g., substance abuse, disordered eating, delinquent behaviours) (Neumark-Sztainer et al., 2000; Neumark-Sztainer et al., 1996; Neumark-Sztainer, Wall, Guo et al., 2006). Older adolescents girls engaged in more unhealthy weight control behaviours, which is consistent with the findings from study 2. The findings are cross-sectional but are in line with the previous longitudinal research, indicating that unhealthy weight control behaviours increased significantly from early adolescence to middle adolescence after 5 years (Neumark-Sztainer, Wall, Eisenberg et al., 2006). These findings highlight that there is scope for interventions to educate Taiwanese youth about the healthy way to approach weight management where it is needed.

6.4.3 Correlations and predictors of body dissatisfaction

The present study showed that BMI was the strongest predictor of body dissatisfaction in both genders. Perceived overall appearance (MBSRQ-AE) and internalisation of the socio-cultural ideal (SATAQ-Internalisation) also explained variance in body dissatisfaction beyond the contribution of BMI. However, awareness of the socio-cultural ideal (SATAQ-Awareness) was not a significant predictor for body dissatisfaction among either boys or girls. It might be that being aware of the cultural ideal may not have an impact on body dissatisfaction until internalisation occurs (Smolak, 2004; Thompson et al., 2001).

The psychological factors, self-esteem and perfectionism, did not contribute to body dissatisfaction in either boys or girls. Findings of Keery et al. (2004) showed no significant association between perfectionism (assessed by EDI) and body dissatisfaction among Australian adolescent girls. However, body dissatisfaction was found to be associated with perfectionism (assessed by Multidimensional Perfectionism Scale) among high school girls by Ruggiero et al. (2003). Therefore,

different measures of perfectionism might contribute the inconsistency. Self-esteem emerged as a significant correlate with body dissatisfaction in the bivariate analyses, which is in accord with preceding studies (Keery et al., 2004; Tiggemann, 2005). Nevertheless, the finding became non-significant when entered into the multivariate model, illustrating that it does not account for a significant amount of unique variance in the presence of the other predictors. On the other hand, self-esteem was highly associated with overall physical appearance (MBSRQ-AE). It is likely that the appearance measure already takes the critical component of self-esteem and there is nothing beyond that that is extra.

Research about the relationship between body image and physical activity is somewhat inconsistent. Duncan and Ai-Nakeeb (2004) found no significant relationships between body image and physical activity among secondary school children aged 11-14. However, some studies have suggested that body image and physical activity might be related. Mikkilia et al. (2003) found that inactive boys were more dissatisfied with their weight than active boys. Tiggeman and Williamson (2000) illustrated a negative relationship between amount of exercise and body dissatisfaction in young women aged 16-21. The current study revealed that the amounts of leisure time physical activity was positively related with body dissatisfaction for girls, but not for boys. These discordances might be due to the difference of sample, on the measures of body image and physical activity. For example, participants in these studies were in different age ranges, from early adolescents (Duncan et al., 2004) through late adolescents (Mikkila et al., 2003) to young adults (Tiggemann & Williamson, 2000). Body dissatisfaction was assessed with various measures, such as figure ratings (this study) or the Body Esteem Scale (Duncan et al., 2004). The measure of physical activity might also provide different results. Duncan and Ai-Nakeeb (2004) considered overall physical activity undertaken across intensities; Tiggeman and Williamson (2000) assess amounts of exercise with several physical activities (e.g., walking, running, aerobics); and this study examined leisure time physical activity. Thus, these differences might explain the disparity between studies.

Overall, the factors relevant to body dissatisfaction as presented in the conceptual framework, largely derived from a White Caucasian population, seem to work with Taiwanese adolescents. There were more similarities than differences between the Western and Eastern adolescents. The biological factors particularly showed the most consistent findings, with girls, overweight/obese, and old adolescents reporting higher body dissatisfaction. As expected, self-esteem showed a negative association with body dissatisfaction and the socio-cultural factors (awareness and internalisation) were positively related to body dissatisfaction. Other factors (e.g., perfectionism, physical activity) provided slightly different results and the possible rationales were discussed such as sample age or measures used. Furthermore, these factors only explained 14% of the variance in body dissatisfaction for boys, compared with 47% for girls. More factors (e.g. weight-related teasing, relationships with parents, pubertal development) should be identified to better understand body dissatisfaction among boys.

The current study provided several strong points. First, it comprised a broad range of variables for examining associations with body dissatisfaction in Taiwanese adolescents, filling the gap in the existing literature focusing on Western populations. The used measurements have been chosen carefully and demonstrated high validity and reliability for the Taiwanese sample. In addition, this study expanded the understanding of body dissatisfaction, in showing how gender differences, BMI-groups, and age groups related to body dissatisfaction in Taiwanese adolescents, providing another strength.

6.5 Conclusion

In sum, findings from this study suggest that both Taiwanese adolescent boys and girls exhibit high body dissatisfaction, especially among the overweight/obese girls. It also enhances understanding about the psychosocial factors involved in body

dissatisfaction. The results illustrated that the desire for thinness is widespread, especially in girls, and the relationships between body dissatisfaction and physical activity are weak. The high prevalence of body dissatisfaction did not lead to actions for engaging in physical activity to weight control, even among many of the overweight/obese adolescents. This would be the topic of the following study (Chapter 7) to address the barriers/motivations of physical activity related to body image, capture adolescents' ideal body image, and how they cope with the ideal with a qualitative approach.

CHAPTER 7 Study 4: Physical activity and body image among overweight and obese adolescent girls in Taiwan

7.1 Introduction

Physical activity is one of the factors holding great promise in the reduction and prevention of overweight and obesity for youth (Fulton et al., 2001). Previous research has illustrated that obese adolescents have significantly lower levels of physical activity as well as a less positive attitude toward physical activity (Deforche et al., 2006). Thus, adolescents with body image concerns might avoid engaging in physical activity due to weight problems. Research has shown that body-related issues were commonly reported as barriers to physical activity, particularly among overweight girls (Zabinski et al., 2003). Physical activity and exercise result in physical changes in body shape, which might lead to improved body image and subsequently influence weight control behaviours. In the long run, it might potentially help to prevent overweight and obesity. However, negative body image can be a barrier to physical activity engagement for overweight/obese individuals. When exercising in public places, overweight/obese individuals might be concerned about other people's impressions of them when they are engaging in exercise (Baker et al., 2000; Goldberg, 1997). Therefore, obtaining a better understanding of factors influencing physical activity participation among overweight and obese girls might help in developing physical activity interventions for this population.

There is little research on physical activity and body image among overweight/obese adolescent girls. Baker and Brownell (2000) called for studies to examine the impact of physical activity on body image among overweight/obese individuals, and whether or not this translates into increased adherence or commitment to weight control. Findings from quantitative study 3 (Chapter 6) showed that the overweight/obese adolescent girls reported higher body dissatisfaction than the non-overweight/obese group, suggesting weight status could be a further factor related to body image. Study 3 also revealed that less than half of the overweight/obese girls who were trying to lose weight adopted exercise to lose weight, illustrating that physical activity was not widely used to lose weight. The other preceding Taiwanese based research has failed

to examine this area regarding the impact of obesity and physical activity on body image concerns among adolescents. Thus, the relationships between body dissatisfaction, obesity, and physical activity require further understanding.

Studies concerning adolescent physical activity and body image have employed quantitative measures (Duncan et al., 2004; KirKcaldy et al., 2002). However, these cross-sectional data and simple correlational analyses might not be able to disentangle the complex relationships between physical activity and body image (Davis, 1997a). Qualitative research gives richness and holism with the potential for revealing complexity and provides full descriptions in understanding the phenomenon under studies (Hill et al., 1997; Miles & Huberman, 1994).

This study was aimed at gaining insight into overweight/obese individuals' attitudes toward physical activity, experiences of obesity and perceptions of body image using a qualitative interview method. The interview would provide an opportunity to enrich the previous quantitative studies of this research. It would also offer a complementary approach for generating the needed knowledge to 1) examine the motivations/barriers for physical activity participation among Taiwanese overweight/obese girls; 2) to explore how they describe the feelings about their own body; 3) to capture their images of ideal female bodies and how they cope with these ideals; 4) to delineate the links between body image concerns and physical activity. With these broad and deep understandings, it would provide an appropriate basis for interventions aimed at promoting an active lifestyle for Taiwanese overweight/obese adolescent girls.

7.2 Method:

7.2.1 Participants

Selection criteria: Participants were selected based on the following criteria:

1) Willingness to be interviewed. All participants involved in the questionnaire survey (study 3) were asked whether they would agree to be interviewed in a follow-

up study. In the informed consent, two options were provided for participating: (a) in the questionnaire survey only or (b) in both questionnaire survey and the interview study.

2) Gender. Only adolescent girls were chosen since girls were less active and showed higher body dissatisfaction than boys in previous studies (Chapter 5 and Chapter 6).

3) Weight status. The previous study revealed that the overweight/obese girls were more dissatisfied with their bodies and little has been published on Taiwanese adolescent girls' experiences of being overweight/obese. Thus, participants who were overweight or obese were selected due to the previous findings and the gap in the literature.

Sample size

Hill, et al. (1997) illustrated that in general, a small number of cases are investigated to gain an in-depth understanding of each case in qualitative research. Using much larger samples is unrealistic owing to the time involved in examining each case intensively and because additional cases typically add minimal new data. However, a too small sample size cannot determine whether findings apply to several people. The ideal sample size for qualitative research was recommended between 8 and 15 cases, which is usually adequate for reaching some stability of results (Hill et al., 1997; Knox et al., 1997) and data saturation. Therefore, a sample size of 15 participants was initially considered appropriate for this study.

Based on the criteria, only 15 overweight/obese girls among all the overweight/obese girls (N=68) indicated that they would be willing to be interviewed when carrying out the questionnaire survey. All candidates were contacted approximately five months after the questionnaire survey. However, two of them withdrew consent resulting in 13 overweight/obese participants from four schools.

7.2.2 Interview guide

It is desirable to understand individual participants as completely as possible and to explore any emerging issues in the interview for each case. Hence, interviews should be semi-structured so that adaptations can be made to fit the particular interviewee and to obtain the richness and depth of information. Therefore, a semi-structured topic and question guide drawn from the literature, previous research, and from the pilot work with respondents was developed to guide the interview.

The first part of the interview was designed to establish a rapport, understand the overweight/obese girls' daily schedules and explore physical activity patterns. The second part of the interview focused on the perception and satisfaction of each girl's body image. Then, the interview extracted how the overweight/obese girls think others perceive their bodies. The final part of the interview aimed to gain the picture of ideal body image and identified the attitude toward obesity from the overweight/obese girl's perspective. The main themes are outlined in Figure 23 (adapted from Loland (1999)).

Figure 23: Semi-structured interview themes

■ My physical activity	Motivation of physical activity Barrier for physical activity e.g. How does physical activity fit in your life?
■ My body and myself	Perception of self body image Satisfaction of self body image e.g. How it feels when you look in the mirror?
■ My body and others	Perception of others' evaluation on self body image e.g. How do you think other people view your body figure?
■ Ideal body and society	Attitude toward obesity Perception of ideal body image e.g. Can you describe your 'ideal' female body?

The crucial point is that consistently similar information across cases is needed to compare cases but that in-depth information is needed to understand the idiosyncrasies of each particular case (Hill et al., 1997). The semi-structured nature of the interview protocol allowed for exploratory probing and further questioning when

necessary (Yeh et al., 2003). As a result, a pre-determined set of questions was prepared to gain the needed information but allowed flexibility in the interview (see appendix 5).

7.2.3 Procedures

In order to enhance experience of the validity, the researcher attended training courses to improve the knowledge and the techniques of interviewing. The interview procedure was self-evaluated following a checklist (appendix 6). Then, a team was formed to analyse the data. The details are described as follows:

Interview practices and pilot interviews

The purpose of the pilot study was to improve the researcher's interviewing techniques, test the interview guide, and evaluate the interview protocol. Four interviews were carried out to determine how potential participants would react to the questions. Two pilot interviews were administered in the UK with adolescent girls from China and Taiwan. Two subsequent pilot interviews were conducted in Taiwan with Taiwanese adolescent girls. These pilot interviews provided some helpful points. For example, the time for interview was suggested to be less than 30 minutes. One illustrated that how girls perceive boy's preferences is important to know and suggested asking 'what kind of girls are the most popular in boys' eyes?' Furthermore, some leading questions were also revised based on discussions with advisors such as 'Do you think physical activity is important for you?' was replaced by 'How does physical activity fit in your life?'.

Main study

Thirteen overweight/obese girls from four schools were interviewed in the main study. However, there was concern that the overweight/obese girls would be aware of the criteria for selection. Consequently, four normal weight girls (one in each school) were chosen randomly from those who agreed to be interviewed. The normal weight

girls were interviewed earlier than the overweight/obese girls to confuse the suspicion of selection criteria by the overweight/obese girls and these interviews with normal weight girls also served as pilot interviews (the data were not analyzed in this study). Although how normal weight girls perceive and experience their body image is also important, it is beyond the scope of this study with a focus on obesity.

The researcher scheduled individual appointments during school hours at times convenient for participants such as tutorial periods or the lunch nap break, which took place in the school health centre or school library. Some interviews were arranged during weekends or holidays according to participants' wishes and these interviews were conducted at the participant's own home. Before each interview, the researcher described the purpose and procedure of the interview and explained why the interview would be taped. Each interview lasted from 25 to 42 minutes. At the end of each interview, the researcher made brief field notes indicating how long the interview took, the participant's mood, and self-evaluated the interview procedure with a checklist (appendix 6) and wrote notes for self reflections. All interviews were audio taped and the audiotapes were later transcribed verbatim in Chinese by the researcher. All the data were analysed in Chinese and only the selected quotes were translated into English. All identifying information was removed from the transcripts and each participant was assigned a code number to maintain confidentiality. All participants were given the option to review their transcripts, though only 2 participants did so and no changes were made. The participants' details and the interview setting are summarised in Table 30.

This project was approved by the Department of Exercise and Health Sciences Research Ethics Committee on 20th November 2005 (reference number 05/045) (appendix 1).

Table 30: Participants' details and interview setting

Code	Age	Weight status (BMI)	Data analysed	Interview setting		
				Date	Time	Interview location
1	14	Normal weight (17.9)	pilot	23rd Feb.	17:35-18:17	School library
2	15	Normal weight (22.1)	pilot	28th Feb.	19:30-20:02	Participant's home
3	15	Normal weight (17.3)	pilot	19th Mar.	11:00-11:25	McDonald's restaurant
4	13	Normal weight (17.2)	pilot	25th Mar.	10:25-11:50	McDonald's restaurant
5	13	Obese (28.2)	Case 1	29th Mar.	12:50-13:20	School health centre
6	13	Overweight (24.3)	Case 2	31st Mar.	14:20-14:42	School library
7	13	Obese (31.2)	Case 3	3rd Apr.	14:00-14:35	School library
8	14	Overweight (23.6)	Case 4	7th Apr.	11:30-11:57	Participant's home
9	14	Obese (29.2)	Case 5	9th Apr.	14:30-14:25	Participant's home
10	15	Obese (31.6)	Case 6	12th Apr.	12:50-13:25	School health centre
11	15	Overweight (24.1)	Case 7	16th Apr.	14:00-14:25	Participant's home
12	15	Overweight (26.4)	Case 8	19th Apr.	11:10-11:38	School health centre
13	15	Overweight (24.6)	Case 9	20th Apr.	12:40-13:20	School library
14	15	Overweight (26.0)	Case 10	23rd Apr.	13:30-14:10	Participant's home
15	16	Overweight (24.6)	Case 11	24th Apr	12:50-13:14	School health centre
16	16	Obese (29.6)	Case 12	26th Apr.	13:45-14:12	School library
17	16	Overweight (26.6)	Case 13	28th Apr.	12:55-13:21	School library

7.2.4 Data interpretation

The method of data interpretation

The method of data interpretation in this study is based on the 'Consensual Qualitative Research (CQR)' approach (Hill et al., 1997), which is a widely used method of analysing qualitative data (Hill et al., 1996; Hill et al., 1997; Knox et al., 1997; Rhodes et al., 1994; Yeh et al., 2003). It is particularly suitable for this study because it 1) emphasizes that the participants are the experts in relation to their inner experience, 2) allows categories to emerge from the data, and 3) permits researchers to describe both individual cases and data across several cases. Furthermore, the CQR highlights the use of multiple researchers and the process of reaching consensus as well as using auditors to check all the work. It involves multiple perspectives and levels of awareness, increasing the approximation of the 'truth' and has the potential to reduce individual biases (Hill et al., 1997).

Procedures for interpreting data

Consensus is considered critical in the CQR to reduce the potential bias inherent in the use of a single judge and to produce a richer conceptualisation of the phenomenon (Hill et al., 1996; Rhodes et al., 1994). It is accomplished by a team through discussing individual conceptualisations and then agreeing on a final interpretation (Knox et al., 1997). The research team consisted of three judges (one is the main researcher in this study and two doctoral researchers in Education field and Exercise and Psychology field) and one auditor (a high school teacher with Masters degree in Education). The procedures of data interpretation are as follows:

1) Coding into domains and core ideas within cases

The researcher e-mailed the transcripts and explained the method and procedure of the CQR to the team members by telephone. Then, three judges independently reviewed the first three interview cases and developed a preliminary list of domains and core ideas. The coding was discussed face-to-face until all judges arrived at a consensus version. It took about two to three hours for each case. The researcher then applied these domains and core ideas to the remaining interviews (Parr et al., 2006).

2) Auditing of domains and core ideas

After completing the domains and core ideas for each case, the auditor examined the results and provided comments about the appropriateness of the domains and core ideas. The research team considered the auditor's comments and arrived at agreement.

3) Categorising across cases

Then, three judges looked across cases together to determine whether there were similarities in core ideas. They went through each domain separately and then placed the similar core ideas into categories. This step took around four hours.

4) Auditing on cross-analysis

The auditor reviewed the cross-analysis and made suggestions. Since only a few suggestions were made, the team discussed this feedback via telephone.

5) Representativeness to the sample

Following the CQR methodology, a category that applies to all of the cases was considered to be '*general*'. If the category applies to half or more of the cases, it was considered '*typical*'. If it applied to three to just less than half of the cases, it is considered '*variant*'. Any categories that apply only to one or two cases are dropped from further consideration based on the CQR method, indicating such infrequently occurring categories are not considered to be descriptive of the sample (Hill et al., 1997).

The overall procedure for this study is presented in Figure 24.

Pre-interview

1. Enhance validity:
   1.1 Training courses: Interviewing techniques that build rapport, trust and openness
   1.2 Literature review & interview practices: Interview guide that contain questions drawn from the literature and from pilot work with respondent
2. Choose and structure team:
   2.1 Three researchers: the researcher in this study and another two researchers (one Dr. in exercise and psychology field and the other Dr. in education field)
   2.2 One auditor: a high teacher with Masters degree in Education
3. Recruit participants: interview practices and pilot
4. Pay attention to things below before conducting interviews:

Are there enough tapes, batteries? papers? pens/pencils? Is the recorder working?

↓

Interview

1. Observation diary:
   1.1 Direct observation about the interviewees' body language, emotion, the way they talk, express, and how their face looks like, etc)
   1.2 Summary of key words
2. Check the list for evaluating interview practice
3. Complete and check transcripts (also observation of voice when listen to the tapes)
4. Sent transcripts to participants for correction.

↓

Data analysis

1. Within cases:
   1.1 Develop domains and core ideas within cases
   1.2 Feedback from auditors
   1.3 Revise domains and core ideas
2. Cross cases:
   2.1 Develop categories within domains across cases
   2.2 Feedback from auditors
   2.3 Revise categories

↓

Write up and present results

Figure 24: Interview Flow chart

7.2.5 Personal reflection

Research on interviewing suggests that people might respond differently depending on how they perceive the interviewer (Martyn, 1999). Therefore, the issues of interviewer effects and research relationship are important considerations for this study.

Personal identity

Age gap and social status: I am female and 36 years old, the same gender as the participants but two or three times their age. The age gap might prevent me from understanding this young population. For example I might not understand the common topics of conversation they had and the specifically popular language they used. Then, the power imbalance between the researcher and participant, specifically between adults and children was highlighted. I was aware that in general children are taught to listen to, respect and obey adults and they have lower status than adults and lack of power (Gubrium & Holstein, 2002). There is an old saying in Taiwan 'Children have ears but no mouths' (Chen, 1999), which means 'Children have ears to listen to but should avoid using mouths to talk'. Therefore, the power imbalance between children and adults might be even stronger for Taiwanese children, which might have had an impact upon the findings. I acknowledged this issue and made efforts to reduce its impact (which is discussed in the following paragraph).

Weight status and self-perception of body image: I am 1.65m in height and weight 48kg with a BMI value of 17.6, classified as underweight. I have never been overweight or obese and my figure has been quite stable over the past 20 years. This means that I might not be able to really understand the experiences of being overweight or obese the participants had. I care a lot about my body figure but I have never tried to lose weight because I am very satisfied with my body shape, even though I am in the underweight category. It would suggest that I internalise the thin ideal and my ideal is similar to some of these girls. Thus, I might be able to connect

with them on that level and understand their language they used when discussing body image.

Occupational experiences: I used to be a teacher teaching children and adolescents. Gubrium and Holstein (2002) suggested that a teacher should avoid certain controlling behaviours, such as asking participants to stop fidgeting or to stop being silly. I was aware of and paid attention to these issues.

Efforts for diminishing the interviewer effects

After reflecting my personal identity, I tried to minimize the impacts on the outcomes of interviews. The efforts were made and described as follows (Gubrium et al., 2002; Martyn, 1999):

1. Gaining understanding of the communicative norms used by the youth through observations and informal interviews with friends' teenage children before the formal interviews.
2. Adjusting my appearance by wearing loose clothes and jeans, making myself look younger and exposing my body figure less.
3. Introducing myself as a student rather than a teacher, reducing the power imbalance.
4. Creating a natural context for the interview setting, placing the participants within a place they were familiar with and might feel more comfortable.
5. Structuring the interview itself by beginning with very unstructured questions and emphasizing non-directed and open-ended questions (e.g. How is your day?).
6. Encouraging participants to initiate questions and comments. Breaking down the basic power dimension of the interview context by humanising them and empowering the participants (e.g. Do you have any query you want to ask me?).
7. Reporting the findings back to the children to check the accuracy of the adults' interpretations. Allowing children to hear what the interviewers think.

8. Trying to enhance the interview skills, such as being attentive (e.g. writing the field notes, checking the tape-recorded is working), being non-judgemental, tolerating silence during the talk (not pushing participants too much), asking for more details, using checks (e.g. asking for clarifications, summarise their thoughts).
9. Finishing the interviews by inviting participants to raise points that they think need to be covered.

Relationships with participants

All the participants are volunteers and I have no previous or direct relationships with them. The relationship began with the first meeting in the classroom before conducting the interviews. I explained the research purposes and procedures to all students and emphasized this study is funded by the Taiwan Ministry of Education, which would make the tutors and students feel more secure. I informed students that the participants would be selected randomly to be the representatives of adolescents in Taipei County so that they thought it was an honour and they would receive a gift for participation. Then, I contacted the school tutors and nurses to confirm the weight status among 15 overweight/obese girls agreed to be interviewed. Next, I met with the tutors to explain what efforts I needed from them, such as telling students again how lucky they were if they were selected, arranging the tutorial time and locations for interviews based on participants' willingness.

In sum, "there are limits to the context that the researchers can disguise their 'self' during interviews" (Martyn, 1999) (p117). I have made efforts to be polite, respective and neutral. The interview settings were quiet, private and free of distractions and were arranged based on the participants' willingness. Participants were consistently assured regarding confidentiality of the information they gave to encourage the right climate for participants to feel comfortable and provide truthful answers.

7.3 Findings

Data were classified into 7 domains (18 sub-domains) and 45 categories. Categories were considered *general* if they applied to all 13 cases, *typical* if they applied to between 7 to 12 cases, and *variant* if they applied to between 3 and 6. Three categories applied to all participants. Within each domain, the categories are listed in the order of importance based on the number of respondents. Table 31 contains the domains and the general, typical and variant categories emerging from the cross-analyses. Categories that applied to only one or two cases were dropped from the categories of representativeness. However, some themes that did not fit into the categories are still shown in the table since they might be potentially important or interesting.

Findings for each of the domains are described as follows.

Table 31: Results of domain and category

Domain	Category	Representativeness (Frequency)
1. Physical activity		
1.1 Main activity in physical education lessons	Ball sports (basketball, volleyball, tennis, table tennis)	General (13)
	Swimming	Typical (9)
	Track and field (running)	Variant (6)
	Others (dancing, fitness)	Variant (3)
1.2 Attitude toward physical education lessons	Positive	Typical (8)
	Negative	Variant (3)
	Neutral (ok, acceptable)	--------- (2)
1.3 Main activity during leisure time	Academic-relevant sedentary behaviour (studying)	Typical (11)
	Recreational sedentary behaviour (watching TV, reading, internet)	Typical (10)
	Active behaviour (exercise)	Typical (9)
1.4 Motivations for leisure physical activity	Losing weight/improving appearance	Variant (6)
	Pleasure/fun	Variant (4)
	Relaxation	Variant (4)
	Social contact	Variant (3)
	Kill time	--------- (2)
	Improving health	--------- (2)
1.5 Barriers for leisure physical activity	Insecure about appearance	Variant (4)
	Physical complaints (exhausting, difficult to breath, sweating)	Variant (3)
	Dislike exercise	--------- (2)
	Too masculine (gender-inappropriate behaviour)	--------- (1)
	External barriers (no time)	--------- (1)

2. Concept of body image		
2.1 Conception of body image	Body shape/ fat or thin (height & weight) Body appearance/ general look (height, weight, face, skin, breasts)	Typical (8) Variant (5)
2.2 Role of body image	Important / very important Neutral (so-so, ok)	Typical (10) Variant (3)
3. Self body image		
3.1 Perceived self body image	Fat/ very fat/ too fat/ obese Ugly/ not good looking Just right / Normal	Typical (12) -------- (2) -------- (1)
3.2 Perceived other's evaluation on self body image	Fat/ very fat Just right /acceptable Ugly/ not good looking	Typical (9) Variant (3) -------- (1)
3.3. Satisfaction with self body image	Dissatisfied Do not care Neutral (ok, acceptable)	Typical (10) -------- (2) -------- (1)
4. Ideal body image		
4.1 Self ideal body image	Tall but not too tall Thin Average /thin but not too thin Other body parts (white skin/ small physique/ small breasts)	Typical (9) Typical (7) Variant (6) Variant (4)/(3)/(2)
4.2 Perceived social ideal body image	Thin Tall Tall but not too tall Other body part (white skin)	General (13) Typical (8) Variant (5) Variant (4)

5. Attitudes toward obesity		
5.1 Self attitudes toward obesity	Negative	Variant (6)
	Neutral	Variant (5)
	Positive	-------- (2)
5.2 Perceived social attitudes toward obesity	Negative	General (13)
6. Popularity of thinness		
6.1 Sources of pressure to be thin	From others (boy's teasing, girl's fat-talk, parents, friends)	Typical (12)
	From media and society (TV, magazine, internet; fitting into clothes)	Typical (8)
	From self (for health)	-------- (2)
6.2 Coping strategies for pressure to be thin	Negative emotion (unhappy, angry, worried, nervous, anxious, sad)	Typical (9)
	Action (exercise, dieting, weigh, make efforts with clothes)	Typical (8)
	Avoidance (not look in mirror, do not weigh)	Variant (5)
	Positive acceptance	-------- (2)
7. Weight loss behaviour		
7.1 Methods for weight loss	Healthy exercise	Typical (9)
	Healthy dieting (more vegetables, less sweet, less fat, fewer calories)	Typical (7)
	Unhealthy methods (skipped meals, ate very little food)	Variant (3)
	No behaviour (not trying to lose weight)	Variant (3)
7.2 Avoidance of unhealthy weight loss behaviour	Awareness of difficulty for achieving ideal image	Typical (9)
	Positive influence from others (parents, friends)	Variant (4)
	Knowledge about dangers of diet	-------- (2)
	Self-acceptance	-------- (1)

7.3.1 Domain 1: Physical activity

The physical activity issues created a natural context for conversation. It covered the school physical education lessons and the activities outside school time. This physical activity domain consists of five sub-domains, namely main activity in physical education lessons, attitudes toward physical education lessons, main activity outside school time, motivations for physical activity, and barriers for physical activity. Each sub-domain is detailed below:

Main activity in physical education lessons: Adolescents have physical education lessons twice a week in Taiwanese schools, which is compulsory. Four categories emerged for main activity in physical education lessons. All girls indicated that ball sports were the main activity in physical education lessons, followed by swimming and track and field. Most of the girls reported that they played sports with the same gender during the physical education lesson and that they like this way. For example:

> 'We play basketball, volleyball, tennis or table tennis during the physical education lesson.....Boys and girls listen to the lecture together, while separated in different places when practicing or playing sports. I like this way because boys sometimes are aggressive and some want to be the ball hogs (case 7)'.

Attitudes toward physical education lessons: Typically, girls had positive attitudes toward physical education lessons. The main reasons provided for this positive attitude were social contact with classmates and reduction of academic pressure.

> 'Physical education lessons might be the only time for me to do exercise. I have no time to do exercise because the academic pressure is great. I've got to go to the cram school after school. So, I don't have time. I like the physical education lesson because doing exercise is beneficial for health and can reduce the academic pressure (case 2)'.

> 'Physical education lesson is very good. It can increase contacts and promote friendships with classmates (case 4)'.

Some girls reported negative attitudes toward physical education lessons. Three girls disliked or were not interested in physical education lessons. Two expressed insecurity about body appearance during the swimming class and one experienced isolation (The embarrassment for the body issues also served as 'barriers for physical activity' sub-domain).

> 'I don't like, especially swimming class....I have never attended the swimming class. I always find excuses for not going. I have no swimming suit. I just don't want any one see me wearing swimming suit (case 12)'.
>
> 'I don't like ball sports or other physical education classes. Because classmates always exclude me when playing sports,.....They don't want me to join their groups...So, I can only rest under the trees.....I don't know why maybe they don't like me because I am too fat (case 1)'.

Main activity outside school time: Outside school, lifestyle in these girls included academic-relevant and recreational sedentary behaviours and exercise. Typically, girls watched TV, accessed Internet or studied at home. Nine girls took part in physical activity, while 4 girls were totally inactive.

Motivations for physical activity: Various reasons such as losing weight (improving appearance), relaxation, pleasure (fun), and social contact were identified by adolescent girls for engaging in physical activity. The girls described their motivations for physical activity with the followings:

> 'I shake the hoola hoop while watching TV.....shaking hoola hoop can help to achieve a smaller waist and lose weight (case 1)'.
>
> 'I do sit-ups every day. It helps my belly and waist smaller (case 7)'.
>
> 'Exercise can make me feel relaxed (case 9)'.
>
> 'I like doing exercise because it is fun. I feel happy when I do exercise (case 3)'.
>
> 'I think doing exercise can increase the interactions among classmates (case 4)'.

Barriers for physical activity: The major barrier for physical activity is the feeling of insecurity about appearance. The following quotations illustrated this theme:

'When you do exercise, running or something, people feel you are like....just feel you are slow and awkward because you are fat (case 12)'.

'I don't like swimming. I feel I am fat....I am afraid to be teased when wearing swimming suit (case 3)'.

Physical complaints (exhausting, difficult to breathe, and sweating) and disliking exercise were also identified as barriers for physical activity engagement. For example:

'Exercise makes you sweat; and I feel tired after I do exercise...I think exercise is exhausting (case 12)'.

'I don't like exercise. I'm not interested in doing exercise (case 8)'.

Some active girls talked about peers' barriers of physical activity:

'My inactive friends, some of them dislike exercise; some are very heavy so they don't exercise. If you are fat, exercise makes it difficult to breathe and feels exhausting (case 4)'.

'My classmates feel exercise is too exhausting. Sweating also makes them feel uncomfortable (case 11)'.

'Those who don't exercise, some don't like sweating; or they don't like exercise. And most girls feel...exercise is a little barbarous...It makes you look like the boys (masculine). Girls should look like the girls. Many classmates still like Lin, Dai-Yu style (weak / frail image) (case 7)'.

7.3.2 Domain 2: Concept of body image

Adolescent girls described the meaning of the phrase 'body image' in a different way and reported different degrees of body image concerns. This concept of body image domain therefore comprises two sub-domains: conception of body image and role of body image.

Conception of body image: The majority of girls tended to consider body image as body weight and shape. They described what body image is with the following statements:

'It's something like you are fat or thin (case 1)'.

'Body image is your body shape. It's about height and weight (case 4)'.

Five girls described body image as body appearance or the general look of one's body. They talked about height, weight, and specific body parts such as face, skin, and breasts.

'Body image is your body appearance. Your face is very important, which needs to be white (skin), and a thin body...(case 2).'

'Body image is the way you look, fat or not? tall or not? cute or not (face)? white or not (skin) ? ...and....oh, breasts,...not too big (case 10)'.

Role of body image: Typically, girls reported that body image is important or very important and the main reason was boys' preference for girls' appearance. In reference to the importance of body image, they had the following to say:

'Boys only look at body appearance.....just.....they like thin girls. (case 7)'

'Body image is important, but it is you were born with (case 8)'.

'Your appearance is very important because boys always judge people by their face and body shape. They less notice girls' personality, most of them only care about the appearance. They like girls with beautiful and cute face, white skin and thin (case 10)'.

However, a few girls thought body image is just 'ok' or 'so-so'. For example, one pointed out:

'I think body image is ok, not very important, unless you are overweight and unhealthy, then you need to lose weight. I don't care much about body figure or appearance (case9)'.

7.3.3 Domain 3: Self body image

Self body image is an individual's experiences about her own body, including individual's associated thoughts and feelings. The perceptions of others' evaluations also have a significant impact on self body image. This domain involves three sub-domains: perceived self body image, perceived other's evaluation on self body image, and satisfaction with self-body image.

Perceived self body image: All but one perceived themselves to be fat, very fat, too fat or obese. The consistent response was 'I feel I am (very/too) fat'. Two girls mentioned they were ugly or not good-looking.

Perceived other's evaluation on self body image: Girls typically perceived others' evaluation of their body was that they were fat or very fat. 'I think people feel I am very fat (case 1, 7 & 8)'. Three girls reported others' evaluation on their body image was just right or acceptable. 'People think I am just right (case 9)'. 'My friends and parents think my body figure is acceptable (case11)'.

Satisfaction with self body image: Ten girls reported they were dissatisfied with their body image and six of them could not think of any part of their body that was satisfactory. However, two girls stated that they did not care about their body image.

> 'I am very fat. I feel I am not good-looking…I don't like my body appearance (case 7)'.
>
> 'I am dissatisfied with my body; none of my body parts satisfy me. I wish I could change my body figure and have any ideal body (case 5)'.
>
> 'I am fat. I feel my body figure is bad, too strong, I mean…my physique is too big. I wish I were thinner and petite (case 11)'.
>
> 'I have no feeling about my body appearance, neither like nor dislike (case 8)'.

7.3.4 Domain 4: Ideal body image

This domain consists of two sub-domains: self-ideal body image and social ideal body image perceived by these adolescent girls. These issues offer information about the socio-cultural ideals in adolescent girls' mind and whether they internalise these ideals as their own.

Self-ideal body image: Two typical standards were identified for the self-ideal body image including 'tall but not too tall' and 'thin'. Nine girls indicated that ideal girls are supposed to be tall but should be smaller than boys. Seven girls reported that thin is their ideal body image. Some girls (N=6) would like to have an average size (thin but not too thin). A few girls also mentioned other body parts such as white skin, small physique and small breasts (Table 32).

> 'My ideal body is thin and tall but not too tall. Girls should look shorter than boys (case 3)'.
>
> 'The ideal, first, the face need to be white, of course…The body need to be thin but not too thin, mm….average…..too thin is frightening, but also cannot be too fat……About 170cm, weight 60kg. My ideal height is 165-175cm and weight 55-60kg (case 2)'.
>
> 'My ideal is average figure. Not so skinny and all bones….Height is around…mm….less than 165cm and weight 47-48kg. Girls should not be taller than boys and should be feminine like an endearing little bird (case 13)'.

Some descriptions about the self-ideal image provided by the girls are abstract (e.g. tall but not too tall, thin but not too thin). Research has shown that some girls are more likely to articulate the female body in terms of specific ideal weights or sizes, whereas some might be unable to do so and therefore be inaccurate about the weight or sizes (Williams et al., 2006). In this study, some girls did detail their ideals by highlighting the height and weight. In order to understand the abstract descriptions, the interviewer further asked those who did not give the values of height or weight: 'What do you mean by tall but not too tall / thin but not too thin / average figure'. A summary of description about the self-ideal body image is presented in Table 32. The results revealed that these girls did construct the meaning of words differently. For example, case 11 described the self-ideal image with 'thin' and case 13 with 'average

figure'. However, the word 'thin' as described by case 11 could be interpreted as actually physically bigger than 'average figure' as described by case 13.

Table 32: Self-ideal body image

Summary of description about self ideal				
Case	Core idea	Height (cm)	Weight (kg)	Other body parts
1	Tall with an average figure (not too thin)	165 +	50-60	
2	Average figure (thin but not too thin)	165-175	55-60	White skin
3	Thin and not too tall (shorter than boys)	160-175	50-60	
4	Thin and not too tall (too tall would have difficulty to make boy friends)	165-170	55	Small breasts
5	Thin and not too tall (boys like to protect girls who are delicate and petite)	165 -		
6	Thin and not too tall (shorter than boys, if girls are too tall, it would be very strange when standing together with boy friends)	165-175	40-50	White skin
7	Thin and not too tall	160-165	40 +	
8	Average figure			
9	Average figure and tall	160-165	50	Small physique
10	Thin. Girls who are the more delicate and petite the more popular. Girls cannot be taller than boys	160-165	40-50	White skin Small breasts
11	Thin and tall but not too tall, shorter than boys	160-165	50-55	Small physique
12	Average figure, shorter than boys, girls should be delicate and petite (like the interviewer: 48kg 1.65cm)	165 -	50-59	
13	Average figure and not too tall (shorter than boys)	165 -	47-48	White skin Small physique

Perceived social ideal image: All girls perceived the social ideal body image was 'thin' and 'tall' was typically thought to be ideal. White skin was also identified as an ideal trait by four girls. Girls frequently talked about the social ideal with the image portrayed by the media such as singers or models. The most frequently reported social ideal female image (N=7) was Lin, Chi-Lin (see Figure 25), who is the most popular model in Taiwan with a BMI value of 17.17 (weight 52kg, height 174cm).

Figure 25: Lin, Chi-Lin (www.fxxj.com)

'I think the social ideal is about 40-45kg, may be 40-50kg. The body figure is like the model-Lin, Chi-Lin (case 4)'.

'The social ideal image is slim, like the models on TV, like Lin, Chi-Lin, thin and tall (case 5)'.

'The social ideal is like the stars, such as Rainie (161-162cm 42kg). I feel she is thin and her skin is really nice, very white (case 6)'.

'I think the social ideal image is a cute and beautiful face with a perfect body shape, around 165cm 50kg, a little bit thin and not taller than boys (case 9)'.

7.3.5 Domain 5: Attitudes toward obesity

The attitudes toward obesity might influence how the overweight/obese girls view themselves. This domain includes the self-attitudes and social attitudes perceived by these girls.

Self-attitudes toward obesity: Two variant self-attitudes toward obesity were categorised including negative and neutral attitudes. Six girls described heavy/fat people as being fond of eating, lazy, ugly, stubborn, or having a bad temper.

'I feel they might be fond of eating (case 2)'.

'I feel most fat people are lazy (case 4)'

'I think fat people are ugly (case 5)'.

'I think fat people have a bad temper (case 12)'.

However, five girls thought that heavy/fat people are just like normal weight people.

> 'I think, fat people [are] the same as others, like the general, no difference compared with thin people (case 7).'
>
> 'I feel everyone is normal no matter how the body size is (case 9)'.
>
> 'I feel that they are just like normal people (case 11)'.

Perceived Social attitudes toward obesity: All girls perceived that social attitudes toward obesity were negative. Examples include fond of eating, lazy, dirty, messy, awkward, ugly, unpopular, stupid, or being slow. These negative comments of perceived social attitudes toward obesity combined a societal stigmatisation around obesity. This obesity stigmatisation was demonstrated by the following descriptions:

> 'Most people have stigma towards fat people. They think fat people are fond of eating and are lazy (case 1)'
>
> 'In our society, fat people are thought to be bad; they act slow and are awkward. Then, when looking for a job, they won't be employed, because body appearance is very important (case 7)'.
>
> 'People think fat people act slow, think slow, do everything slow, because their physiques are heavier, they cannot catch up with others, ...and difficult to find a job (case 9)'.
>
> 'I feel unfair. Fat people are thought to be slow, and except that, they are discriminated and not easy to be employed. When looking for a job, they are difficult to be employed. I feel so sad.....One of my old sister's classmate, she is very fat and cannot find a job. The problem is, she works very hard but haven't found a job. She is very fat and couldn't lose weight successfully. It may be a biological problem. It is impossible for her to achieve the social standard. She works harder than others, but couldn't find a job just because she is fat. Every time, she went for an interview, the boss would find excuses to reject her. I feel it's so unfair (case 10)'.

Additionally, these young girls also identified that fat people have difficulty finding a job in the society. They anticipated the future experiences of being overweight or obese, which might generate actions for them to try to lose weight.

7.3.6 Domain 6: Popularity of thinness

Popularity of thinness appears to be another key domain related to social pressure to be thin. The girls in this study perceived the popularity of thinness from different sources and acted with different coping strategies to manage this pressure. Therefore, the popularity of thinness domain includes two sub-domains: sources of pressure to be thin and coping strategies for pressure to be thin.

Sources of pressure to be thin: The most pressure to be thin appeared to be from others (boys, girls, family or friends), especially from boys' teasing reported by twelve of the girls. Society and media influences also contributed to the pressure of thinness. The details are shown in the following:

(1) Pressure to be thin from others:

(1.1) Boys' teasing: All but one reported having been teased about their body figures by boys and this is a great pressure to lose weight. Boys tended to nickname these overweight/obese girls with animals; and some girls reacted with negative emotions, which were categorised in the next sub-domain: 'coping strategies for pressure to be thin'

> 'Boys say I'm fat, I feel sad and a little bit angry. I think I care about boys' comments. I wish I could lose weight as soon as possible (case 3').
>
> 'I think people would say my body figure is…bad, ugly….boys nicknamed me fatty, fatty, fatty, fatty……. (case 5)'
>
> 'Boys nickname you with the name of animals. Like you are fat, they nicknamed you "pig", "dinosaur's sister", or "elephant". These are all bad nicknames. Although, I know sometimes they are just joking, I still feel sad and angry (case 7)'.
>
> 'I used to be nicknamed "elephant", something like that. At the beginning, I was very sad, and decided to lose weight. But I was lazy and impatient, my weight has never changed, and since I was very little, I have been very fat, I get used to the nickname, and don't care now. I just let it go (case 8)'.
>
> 'I am always teased by boys; I really want to be thin. During swimming class, boys tease me about my look wearing the swimming suit; they say I'm very, very fat, something like, like, an elephant. They nicknamed me "elephant", "dinosaur's sister", when heard it, I felt uncomfortable, of course; but what can I do? I was round from when I was little; I become fatter now. So, I'm even more eager to lose weight…….It is just because of boys' comments, I care more about

it.....There is always pressure to be thin, because you are teased as a fatty everyday (case 10)'.

'I always worry about people talking about my body figure. Before weighing or the swimming class, I would try to lose weight painstakingly and eating less to avoid of being teased (case 2)'.

(1.2) Girls' fat-talk: Typically, girls (N=8) indicated that they have never talked about weight or body issues with others openly, because they thought others couldn't understand their feelings. However, participants reported that 'fat-talk' is common among the thin or normal weight girls. These thin or normal weight girls frequently complained that they were too fat, talked about which body parts they were dissatisfied, or how much weight they wanted to lose. The fat-talk added extra pressure to be thin for the overweight/obese girls and this might be regarded as indirect teasing.

'I won't talk about weight or body issues with others, because friends are all thinner than me; but, they always say they are very fat. I feel strange that why they want to lose weight; they are actually really thin. If they were fat, then, what should I do? I might need to die. When I hear them say: "I'm so fat", I feel stressed to lose weight (case 4)'.

'Some classmates are very thin, but still complain that they are very, very fat. I would like to slug / smack them, because they are actually very thin; unlike me, so fat (case 5)'.

'When you see people are thin, you just want to lose weight. Some girls are very thin and have been saying: "I'm very, very fast". I feel that they are loathful.....I won't talk about weight or weight loss issues with classmates; anyway,.....they would never understand (case 7)'.

(1.3) Parents or friends: A few girls pointed out that their parents or friends would like them to lose weight. For instance:

'My mother and father say I'm too fat and want me to do exercise; I wish I could be thinner, but I'm lazy and I don't like exercise. I'm not interested in doing exercise. I just like to be inactive (case 8)'.

''My friends encourage me to lose weight. They say I was prettier before because I was thinner. So, I even more want to lose weight (case 13)'.

(2) Thin pressure from media and society: Eight girls reported that the media image increased a desire to be thin. A few girls described that fitting into clothes was one of the reasons to drive for thinness. These were illustrated with the following statements:

> 'The female stars in TV programmes are beautiful. Whenever I see the images, I would think of myself. I want to look like them (case 2)'.
>
> 'I feel the stars are perfect. Their figures are the social norms. Boys like the standards and think they are cute. I think the stars' body figures are beautiful. I have been trying to lose weight and drive for these standards (case 7)'.
>
> 'I feel that clothes always look better on thin people, like the models. You cannot wear some beautiful clothes because you look fat and ugly in the clothes. And, sometimes you cannot buy the clothes you want because there is no big size for you (case 10)'.

Coping strategies for pressure to be thin: Three kinds of strategies were identified to cope with the pressure to be thin. The first typical strategy was expressing negative emotion including feeling unhappy, angry, worried, nervous, anxious, and sad. The second typical strategy was adopting various actions to try and achieve thinness such as exercise, dieting, and making efforts with clothes.

> 'I weigh myself every day. If my weight increases, I would scream; if it goes down, I would be very happy….I exercise every day and eat food with less fat and calories to lose weight (case 7)'.
>
> 'I wear the swim suit with a skirt to hide as much as I can….Usually, I exercise to lose weight like shaking hoola hoop to help me achieve a smaller waist; then, dancing or running if I have time (case 10)'.
>
> I always weigh myself. If weight reduces, I am very happy; if it increases, I dare not eat and feel nervous and worried….I was very fat before; now, I have lost about 10kg. I have been shaking hoola hoop to reduce the size of my waist and eating less to lose weight. My goal is to lose 10kg again (case 11)'.

A few girls coped with this thin ideal by avoidance, for instance, not looking in the mirror or not weighing themselves. The avoidance behaviour was found to be positively and significantly correlated with weight and shape overconcern (Farrell et al., 2004).

'I don't weigh myself. I had thought about losing weight but have never tried because I think that I would never succeed. It's difficult; the body figure is "God-given". I just resign myself to my fate (case 12)'.

7.3.7 Domain 7: Weight loss behaviour

In order to achieve thinness, girls adopt different methods to lose weight. Thus, methods for weight loss formed a sub-domain in this issue. Few unhealthy weight loss methods were reported among these girls. The rationale for avoidance of unhealthy weight loss behaviour emerged as another sub-domain.

Methods for weight loss: All but three were trying to lose weight. Typically, girls reported healthy methods to lose weight including exercise, eating more vegetables, eating foods with less fat or eating fewer snacks. Only three girls used unhealthy methods to lose weight including skipping meals and eating very little food. None of the extremely unhealthy weight loss methods such as taking diet pills, taking laxatives or vomiting were reported by these girls. The findings were consistent with the previous quantitative studies (Chapter 5 and 6), suggesting a small proportion of Taiwanese adolescents adopted unhealthy weight loss behaviours. Table 33 presents the reported methods adopted by girls.

Table 33: Weight loss method adapted by participants

Case	Weight loss methods	
	Healthy behaviour	Unhealthy behaviour
1	Exercise (hoola hoop)	Skip meals
2	Used to exercise (sit-ups); eat fewer fat foods	Skip meals
3	Exercise (ball sports)	
4	Exercise (ball sports); eat fewer fat foods; eat more vegetables	
5	Exercise (ball sports); eat foods with fewer calories	
6	Eat fewer fat foods	Skip meals; used to eat very little food (only drink cold water to control appetites)
7	Exercise (sit-ups); eat foods with fewer calories	
8	Not trying to lose weight (totally inactive)	
9	Not trying to lose weight, but exercise for fun and health (hoola hoop; dancing or running)	
10	Exercise (hoola hoop, dancing);	
11	Exercise (ball sports, hoola hoop); eat fewer fat foods	
12	Not trying to lose weight (totally inactive)	
13	Exercise (running); eat fewer snacks; no dessert	

Avoidance of unhealthy weight loss behaviour: Awareness of difficulty of achieving the ideal image was the most prevalent response for avoidance of unhealthy weight loss behaviour. The difficulties of achieving the ideal prevented girls from setting unrealistic goals; and this might contribute to the fact that few girls reported using unhealthy weight loss methods. In addition, positive influences from parents or friends were identified as protecting against unhealthy weight loss behaviour by four girls. Two girls reported that they were aware of the dangers of unhealthy weight loss methods.

> 'Achieving the ideal body is not easy, because it might not be successful. It is a very difficult thing, it's painful…..I lose weight, just want to be a little thinner, not exactly to achieve the ideal goal because it is hard to achieve (case 3).'
>
> 'I had ever thought about losing weight but have never tried because I think that I would never succeed. It's difficult; the body figure is "God-given". I just resign myself to my fate (case 12)'.
>
> 'I think that the ideal body is not easy to achieve because the body figure is innate. The physique is difficult to change. One of my friends used to fasting for weight loss. She did lose some weight at that period but also got a serious health problem: gastric ulcer. Now, she is still very fat…..So, I want to lose weight healthily (case 13)'.
>
> 'I have never tried to lose weight. Sometimes my mother asks me whether I am trying to lose weight when she sees the advertisements for weight loss, because a lot of people want to lose weight now. I always say: "no, I won't lose weight as long as I'm healthy". Sometimes my parents encourage me, say something, like "actually your body figure is just right/normal; you don't need to lose weight". They hope I can eat healthy. I think it's helpful and useful. I feel more confident about myself (case 9).'

7.3.8 Observation and feedback from participants

At the end, 13 overweight/obese girls participated in this study. Four obese girls seemed to be introverted and reserved (case 1,5,6,12). Sometimes, they did not look at me when talking to me. One overweight girl was quite shy and spoke very softly (case 8). I repeated her answers quite often. Four overweight girls and one obese girl were very open minded and outgoing (case 2,3,4,7,9). Some of them were optimistic and responded to the questions quickly and confidently (case 2,7,9). They smiled and

laughed quite often during the interviews. Three overweight girls seemed uneasy or nervous at the beginning (case 10,11,13). After talking about the physical activity issues, they became more comfortable and seemed to be more at ease. Sometimes they smiled at me when they felt a bit embarrassed (e.g. when talking about the breasts issues, case 10 shrugged her shoulder and smiled at me). Overall, these girls seemed quite at ease in talking with me.

Additionally, one special case was observed. Case 9 looked in the normal weight range and this was suggested by the school tutor and nurse. I felt the same. It seemed that she exercised regularly so her muscle might be heavier, contributing to a greater BMI value. She exercised for health not for weight loss. Her perceived self-image was ok. She criticised the social thin ideal, and expressed that people should not be judged by their body appearance. It is uncertain that whether her positive attitudes toward body image could be attributed to her looks (she looked in the normal weight category).

I tried to explore whether there were differences in the responses between the overweight and obese girls. However, no specific pattern was found. Not all the obese girls showed stronger desires for thinness than the overweight girls, but the majority of obese girls tended to be more introverted and reserved during the interviews.

Two girls provided feedback to me through the tutors. One said that it was an interesting conversation, though she was a bit nervous at the beginning (case 10). She hoped that I could also interview her old sister. However, this is beyond the purpose of this study. The other girl thanked me for talking to her and she told the tutor she liked me (case 12). The tutor said that she was surprised that this girl agreed to participate in this study since she was introverted, reversed, and quiet in the class.

7.4 Discussion

7.4.1 Obesity stigmatisation and thin popularity

With no exception, girls perceived that obese individuals are stigmatised and thinness is regarded as the ideal female image in society, which is in accord with previous research (Cash, 1990; Grogan, 1999; Tiggemann et al., 2000). However, the influencing processes of the thin ideal may have different perceptual, affective, cognitive, and behavioural consequences for adolescent girls. Some girls might be aware of the social ideal of thinness and have internalised it as their self-ideals. The internalisation idea is supported by the preceding quantitative study (Chapter 6) and this qualitative work. It is possible that this internalisation may drive girls to make efforts to achieve social standards. However, this is not consistently born out in the present interviews. Some girls might perceive (awareness) but reject (non-internalisation) the thin ideal and do nothing about it. Based on the responses from the interviews, girls might be identified as one of the following four types (adapted from Murray (1999)) (Figure 26):

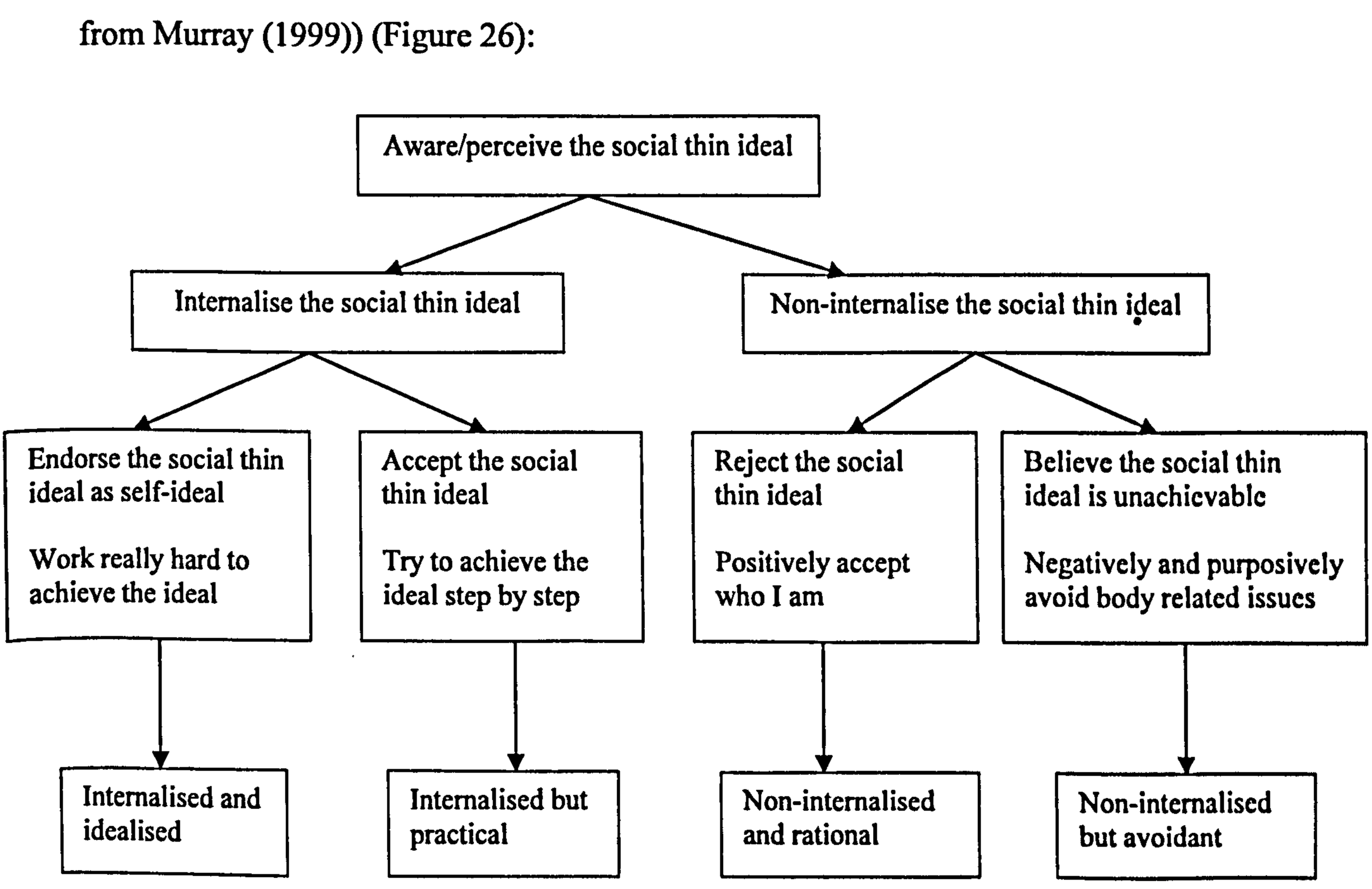

Figure 26: Influence processes of the social thin ideal

(1) Internalised and idealised: Those who endorse the thin ideal and view such an ideal as reasonable or desirable. Then, they work extremely hard to achieve the thin ideal (case 1, 4, 6, 7, 11).

(2) Internalised but practical: Those who accept the thin ideal but are aware of the difficulties of achieving the ideal. They pursue a thinner body than the one they perceived currently (case 2, 3, 5, 10, 13).

(3) Non-internalised and rational: Those who are aware of the social ideal of thinness but reject the ideal. They think the ideal is too thin and believe that people should be judged by what is on the inside (case 9).

(4) Non-internalised but avoidant: Those who are aware of the social thin ideal and consider the ideal as unachievable. They believe that you can do very little to change the body appearance and purposively avoid body related issues (case 8, 12).

Internalisation may serve as a protector for negative body image and weight concerns. As Hesse-Biber et al. (2004) argued, internalisation operates in a manner in which external social beliefs are adopted by the individual and therefore became internal personal beliefs. By rejecting or ignoring the social values of thinness, individuals might be able to prevent themselves from adopting a negative body image and unhealthy weight control behaviours. In this study, Taiwanese adolescent girls already clearly expressed their perceptions about social values in relation to obesity and ideal female image. However, most girls might not demonstrate sufficient independent thought yet to criticise the unrealistic ideal image; and they are vulnerable to the social ideal of thinness, although a few girls did not internalise (accept) the ideal of thinness as their own.

7.4.2 Boys' weight-related teasing and girls' fat-talk

The boys' teasing was identified as the most frequent and strongest factor in relation to the pressure to be thin for the overweight/obese girls in the present study. Preceding interview studies revealed that media portrayal of the thin ideal was presented as the major pressure to be thin among the general population of adolescent girls (Tiggemann et al., 2000; Wertheim et al., 1997). This suggests that weight-related teasing might be one of the discriminating reasons for pressure to be thin between the normal weight and obese girls.

The girls' fat-talk is well documented by previous research (Lloyd & Dittmar, 1997; Wertheim et al., 1997). Wertheim et al. (1997) indicated in their research that adolescent girls in Australia could talk openly with friends about body issues and they were unaware of the fat-talk effect had on others. In the present study, most Taiwanese overweight/obese girls felt they could not talk openly with others but they did report much pressure to be thin from the fat-talk by the thin or normal weight female peers. Although it is uncertain whether the unwillingness to join in fat-talk is due to the sample differences of body size, the ethnicity, or individual personality, it is evidenced that the thin or normal weight girls' fat-talk appear to have strong effects on the overweight/obese girls in Taiwan.

7.4.3 Physical activity and weight control

As expected, losing weight/improving appearance emerged as a major motivation of physical activity participation among these overweight/obese girls. The findings are parallel to previous research that found that losing weight and looking better was a primary motivator for the obese adolescents (Deforche et al., 2006). A main hindrance to physical activity engagement for overweight/obese girls found in this study was the feelings of insecurity about appearance. Girls reported body consciousness and concerns about boys' weight-related teasing whilst doing physical

activity. Particularity, certain types of activities involving body exposure (Eklund & Crawford, 1994), such as wearing revealing attire (swimming suit) or having to move quickly (running), might increase body consciousness in overweight/obese girls. This is in line with other studies that found body-related concerns to be the most frequently reported barriers to physical activity among adolescent girls (Leslie et al., 1999; Robbins et al., 2003), particularly among obese girls (Deforche et al., 2006; Zabinski et al., 2003).

In general, appearance plays a dominant role in developing overweight/obese girls' motivations and barriers toward physical activity engagement. They reported losing weight/improving appearance for physical activity participation, whereas the feelings of insecurity about appearance might also keep them away from being physically active. Interestingly, it appears that overweight/obese girls found a way to overcome this conflict. Some specific activities which were perceived to have a positive affect on shaping the body or losing weight were identified such as playing hoola hoop while watching TV, doing sit-ups in rooms, dancing at home. These activities could be done in a place where they do not need to worry about how they look and therefore, reduce body consciousness. This might explain that playing hoola hoop emerged as the top five popular activities among the older adolescent girls in the previous quantitative study (Chapter 5). In addition, the schoolteacher organised separate activities by gender during physical activity lessons, which might also help to decrease the insecurity about appearance and avoidance of boys' teasing when doing activities for overweight/obese girls.

7.4.4 Physical activity and femininity

Girls thought that females should be thin and should not be bigger and taller than boys because girls need to be petite, feminine, and not masculine. Furthermore, socio-cultural norms suggest that boys should be masculine and protective towards girls. These findings are in agreement with preceding qualitative studies indicating that girls did not want to become too muscular as it would be inappropriate for women

and thinness is a sign of femininity (Grogan et al., 1996; Tiggemann et al., 2000). Therefore, girls strive to be thin but also avoid being too muscular, which might result in the preferences for light activities participation for instance shaking hoola hoop.

Then, the colour of skin is an interesting issue across cultures. The Asian cultures have viewed white skin as a sign of femininity and purity (Kawamura, 2002). In this study, some Taiwanese adolescent girls reported white skin as an ideal trait. The strong sunshine in Taiwan might lead to unwillingness by adolescent girls to engage in outdoor activities because of the preference for white skin.

7.4.5 Limitations

Some limitations need to be considered when drawing these conclusions. The small sample size brings into question the potential representativeness of these participants. Participants who agreed to participate may have differed from those who did not. It is possible that those who agreed to be interviewed might have different characteristics from those who did not, such as being more outgoing/extraverted, which are directly related to their perception of body image. However, from the observations of the participants, it seems that shy or introverted girls still found it interesting to participate, which might be due to curiosity. There might have been social desirability bias in participants. Although confidentiality was emphasised, they might feel hesitant about talking about body issues freely since Taiwanese students are less encouraged to express their thoughts in school and to adults (e.g. even independent researchers).

In addition, analysis interpretation bias is always a concern in qualitative research. Though this study tried to address this potential limitation by using three individuals on the team as well as an auditor in developing the core ideas, not all interviews were analysed by all three team members. One member only completed the procedure of coding domains and core ideas for the first three interviews. This might caused bias potentially, although one study adopting the CQR showed that the research team also

coded the domains and core ideas within the first three cases (Parr et al., 2006). The CQR is a good way of analysing the qualitative data with a structured team; nevertheless, the procedure is very time-consuming.

7.5 Conclusion

Despite the above limitations, this study adopted a qualitative interview method to gain in-depth information from adolescents' perspective. It provides a preliminary understanding of body image concerns and the role of physical activity in weight control behaviour among overweight/obese adolescent girls in Taiwan. In sum, the social value of thinness discriminates against obese individuals; thus, the weight-related teasing is evidenced among overweight/obese adolescent girls and fosters them to idealise thinness and put themselves in a desire to lose weight. These overweight/obese girls also identified losing weight as the major motivation for physical activity participation. As a result, overweight/obese girls might be encouraged to be more active with the reason of losing weight (Robbins et al., 2003). However, as Deforche et al. (2006) indicated losing weight/improving appearance is only an extrinsic motive and is not likely to sustain long-tern physical activity participation. When promoting physical activity in overweight/obese girls it is important to increase intrinsic motives (e.g. pleasure, satisfaction). For example, some girls reported lack of interest for physical activity. Providing participants with a choice of types of activities and allowing them to find most enjoyable activities might be a feasible approach (Wing & Jakicic, 2000). Furthermore, obese girls strive to be thin, while it is always beyond their reach due to the unrealistic ideal. Therefore, positive body image and advice of weight control strategies could be given in single sex physical education lessons to help girls avoid internalisation of the unrealistic thin ideal, weight concern, and unhealthy weight control behaviour.

CHAPTER 8 Discussion

8.1 Summary of the findings

This research consisted of four studies using both quantitative and qualitative approaches and three techniques, including secondary data analysis, questionnaire survey and interview. It provides further understanding about the prevalence of obesity, physical activity and body dissatisfaction and the link between these variables among Taiwanese adolescents. This section summarises the findings within each study (Table 34).

Table 34: Summary of the major findings of the four studies in three phases

Phase	Study	Objectives	Research design	Results	Conclusions
I	1	1.Examine the prevalence of childhood and adolescent obesity in Taiwan. 2.Investigate the association between obesity, physical fitness and health.	1.Method: Quantitative dataset analysis 2.Sample: a total of 13935 children and adolescents aged 6-18 were involved in the 1999 survey and 24586 were available in the 2001 survey. 3.Measures and analyses: Weight, height, systolic and diastolic blood pressures, and health-related fitness tests were measured. Analyses of t-test, ANOVA, and logistic regression were conducted.	1.The overall prevalence of overweight/obesity in boys was 19.8% in 1999 and 26.8% in 2001. It was lower in girls with 15.2% in 1999 and 16.5% in 2001. 2.The normal weight group performed better than the overweight/obese group in all fitness tests except in the 2001 sit-and-reach test with no differences between the two groups. 3.The risk of hypertension increased 2 times for the overweight/obese-fit group and 3 times for the overweight/obese-unfit group compared to the normal weight-fit group.	1.The findings demonstrated that there is an increasing trend in overweight/obesity prevalence for Taiwanese youth even in a two-year period. 2.The overweight/obese youngsters tend to have poorer muscular strength and cardiovascular endurance than the normal weight group. 3.The overweight/obese and unfit group had a greater risk of hypertension than other groups. However, this risk was significantly lower if obese/overweight children had a higher than average level of cardiovascular fitness.
	2	1.Assess the prevalence of physical activity in Taiwanese adolescents. 2.Examine the associated socio-demographic and behavioural variables with physical activity.	1.Method: Quantitative dataset analysis 2.Sample: National representative sample in Taiwan in 2001 with 2235 adolescents aged 12-18 years. 3.Measures & analyses: Univariate and multivariate logistic regression analyses were conducted to examine associations of demographic and behavioural variables with physical activity.	1.80% of adolescents reported engaging in some physical activity; 28.4% of the sample met recommended guidelines. 2.Boys and urban adolescents were more active than girls and rural adolescents; the physical activity prevalence declined with age. 3.Mean sedentary time was 9.5 hours each day. 4.Though the proportions of non-students, regular smokers or drinkers were small, around half of them were physically inactive.	1.The percentage of Taiwanese adolescents meeting recommended amounts of physical activity for health is low, particularly, girls in the 15-18-age range being the least active. 2.Associated factors with physical activity include both demographic and health behaviour variables. 3.These data provide a baseline for future comparisons and preliminary identification of groups at higher risk of low physical activity in Taiwan.

II	3	1.Assess body dissatisfaction among Taiwanese adolescents. 2.Examine the relevant factors associated with body dissatisfaction. 3. Serve as a means of identifying appropriate candidates for the follow-up interview.	1.Method: Quantitative questionnaire survey 2.Sample: A total of 883 students aged 12-16 enrolling in high school (grade 7-9) in Taipei county in 2005. 3. Measures and analyses: Body image, physical activity, and related variables were measured. Analyses of t-test, ANOVA, Person correlation, and logistic regression were conducted.	1.18% of boys and 16% of girls satisfied with their body; 50% of boys and 74% of girls wanted to be thinner. 2.Boys showed higher MBSRQ-appearance evaluation and physical activity; and lower body dissatisfaction, SATAQ-internalisation and SATAQ-awareness than girls. 3.The overweight/obese group had greater body dissatisfaction than the normal weight group. 4.The predictors of body dissatisfaction were BMI, MBSRQ-appearance evaluation and SATAQ-Internalisation in both genders.	1.A high proportion of adolescents wanted to be thinner and gender differences in body dissatisfaction are apparent in adolescence with Taiwanese sample. 2.Body weight category was strongly associated with body dissatisfaction, especially obese girls tended to exhibit greater body dissatisfaction than non-obese individuals. 3.The desire for thinness is widespread, especially for girls. However, the high prevalence of body dissatisfaction did not lead to physical activity engagement to control weight, even in overweight/obese adolescents.
III	4	1.Gain insight into the overweight/obese girls' views toward physical activity. 2.Explore how they feel about own body. 3.Capture their' images of ideal female body and how they cope with these ideals. 4.Delineate the links between body image concerns and physical activity.	1.Method: Qualitative interview 2.Sample: 13 overweight/obese girls were interviewed in 2006. 3.Method for interpretation: Consensual Qualitative research	1.7 domains (18 sub-domains) and 45 categories were identified. 2.The main motivation for engaging in physical activity was losing weight and the main barrier was insecure about appearance. 3. Typically, girls were dissatisfied with their body and perceived the social ideal image was thin. 4.The main source of pressure to be thin was from others, especially from boys' teasing. 5.Exercise and dieting were the main methods for weight loss used by participants.	1.Body appearance plays a dominant role in developing overweight/obese girls' motivations and barriers about physical activity engagement. 2.The society values thinness and discriminates against obese individuals; thus, the weight-related teasing is evidenced among overweight/obese adolescent girls and facilitates them to idealise thinness and put themselves in a desire to lose weight.

8.2 A synthesis of the findings

The four studies examined obesity, physical activity, body image and a number of health-related behaviours (e.g., weight control behaviour) and other factors (e.g., gender) among Taiwanese adolescents. This next section offers a synthesis of the findings across studies, which is presented and discussed around the following three issues:

- Adolescent obesity
- Obesity and body dissatisfaction
- Body dissatisfaction, physical activity and weight loss behaviour

8.2.1 Adolescent obesity

Is obesity a problem in Taiwanese adolescents?

Across three surveys in this research, the findings are concerning since they show that there is an increasing prevalence of overweight and obesity among Taiwanese adolescents aged 12-18. The overweight/obese prevalence increased significantly from 1999 to 2005, especially for boys (boys: 17.6% in 1999 to 34.7% in 2005, $p<.001$; girls: 12.2% in 1999 to 16.0% in 2005, $p=.006$) (Figure 27; also Figure 19 by age groups in Chapter 6, p124).

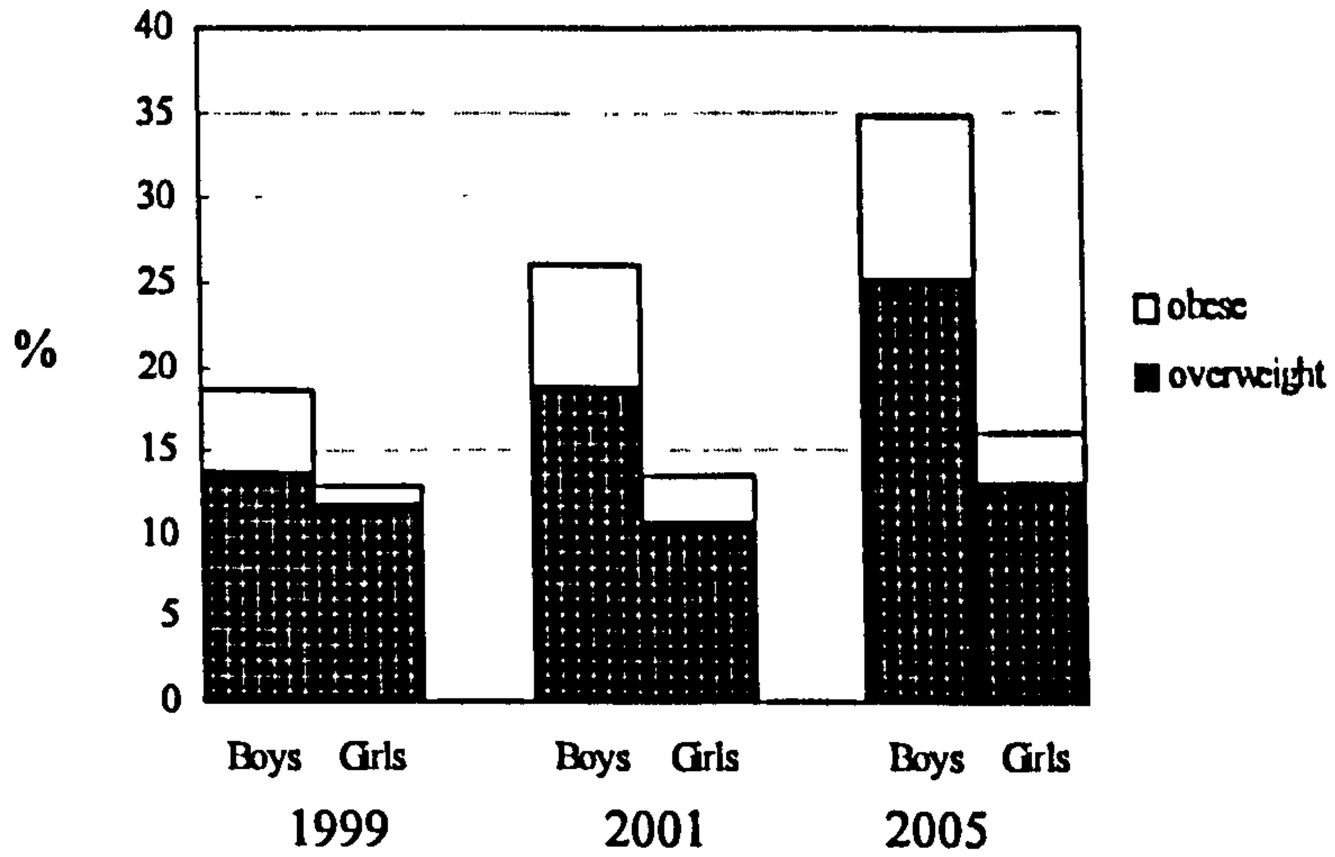

Figure 27: Prevalence of overweight and obesity from 1999 to 2005

The high and increasing prevalence of childhood and adolescent obesity is a major public health concern owing to its health consequences and persistence into adulthood

(Cole, 2006; Department of Health and Human Service, 2001; Gordon-Larsen & Popkin, 2006; Lobstein et al., 2004; Must et al., 1999; Neumark-Sztainer, Wall, Eisenberg et al., 2006; World Health Organisation, 2000). Study 1 demonstrated that obesity is associated with poor health. The overweight/obese adolescents showed poor performance in fitness tests including the bent-leg curl-ups and step test and were at higher risk of hypertension compared with the normal weight adolescents. The overweight/obese adolescents also reported lower self-esteem than the normal weight adolescents in study 3 and they are often the victims of being teased at school. Study 4 revealed that all but one of the overweight/obese girls received weight-related teasing by peers in schools, sometimes being the cause of depressed mood. As a result, obesity is associated with both physical and psychosocial problems for Taiwanese adolescents.

8.2.2 Obesity and body dissatisfaction

Is obesity a factor associated with body dissatisfaction in Taiwanese adolescents?

Overweight or obese adolescents are at risk for physical and psychosocial consequences as found in the reviewed literature (Chapter 2) and this research (Chapter 4, 6, and 7). The psychosocial impacts of obesity might be the most widespread consequences (Dietz, 1998), and body dissatisfaction is one of the issues occurring most commonly among adolescents. Body dissatisfaction is associated with various dimensions of health-related habits such as exercise, weight, and eating behaviour, and blends in the psychological component of self-image (Harris et al., 2003). Previous studies have indicated an association between body dissatisfaction and a variety of negative health implications and behaviours, such as increased rates of depression, restricted eating patterns, and the development of eating disorders (Neumark-Sztainer, Paxton et al., 2006; Stice & Bearman, 2001; Wertheim et al., 2001). This research revealed that BMI was positively related to body dissatisfaction and was the strongest predictor of body dissatisfaction in both Taiwanese adolescent

boys and girls. Thus, obesity is related to body dissatisfaction among Taiwanese adolescents.

Is socio-cultural ideal a contributor to body dissatisfaction in Taiwanese adolescents?

The overweight/obese adolescents reported higher body dissatisfaction than the normal weight individuals, which might be due to the consequences of weight prejudice and discrimination in society. Study 4 illustrated that the overweight/obese girls believe that society views the overweight/obese individuals in a negative way, often associating fat people with being lazy, dirty, messy, awkward, ugly, unpopular, or stupid. Consequently, they demonstrated high levels of body dissatisfaction and felt under pressure to lose weight. The increasing prevalence of obesity coupled with a cultural ideal image of thinness might increase body dissatisfaction for girls. However, body dissatisfaction seems to be 'a gendered phenomenon' (Ter Bogt et al., 2006) within the socio-cultural context. Study 3 suggested that there was a gender-specific cultural pressure on ideal body shape with girls wishing to be thinner and boys wishing to be thinner or bigger. Hargreaves and Tiggemann (2006) indicated that 'this gender difference in the domain of discontent (thinness verse muscularity) mirrors the difference in societal beauty ideals for women and men' (p 568). The following will then further explore the social ideals in Chinese culture for both genders.

(1) Female ideal image in Chinese culture

This research found that about 74% of girls desired a thinner body and the proportion is similar to preceding studies with Taiwanese adolescent samples, indicating 66% to 72% of girls wanting to be thinner (Page et al., 2005; Wong et al., 2000). In addition, the normal weight girls also reported a high prevalence of body dissatisfaction. The preference of thinness among Taiwanese adolescent girls is widespread. Compared with the estimates for those who wanted to be thinner in two reviewed studies (Levine et al., 2002; Ricciardelli et al., 2001a), Taiwanese adolescent girls seem to

show a relatively high prevalence of body dissatisfaction. Previous researchers have tried to interpret this phenomenon, suggesting that early traditional Chinese society valued fatness and viewed obesity as a sign of prosperity, good health or beauty (Kawamura, 2002; Lee, 1999; Wong et al., 2000), and the phenomenon of driving for thinness is attributed to Westernisation (Lam et al., 2002; Lee et al., 1996; Sands & Wardle, 2003; Shih et al., 2002). Consequently, there might be a conflict between Western and traditional Chinese ideal body image, which therefore, contributes to the high prevalence of body dissatisfaction for Taiwanese (Wong et al., 2000). However, it would have been more convincing if the interpretation considered the historical, cultural and social context for female beauty, which might affect the level of body dissatisfaction and body preferences for understanding the ideal body image in the Chinese culture of Taiwan.

Chapter 2 provides a comprehensive review of the historical trends of the ideal female body throughout the Chinese history. It appears that Chinese culture generally regards being thin and frail as a beauty ideal for women, though the ideal body image might change over time. For relatively short time periods, the image of full and rounded hips representing a symbol of fertility (Lee, 1999; Li, 2001) was culturally valued. For example, women in Tang dynasty (618A.D.-907A.D.) appreciated a plump figure as a look of robustness (Liu & Chang, 2003). However, it is an aesthetic rarely found in other periods throughout Chinese history. The ideal image of Chinese feminine beauty conveyed from the poetry, paintings, or sculptures appears to be delicate, fragile, and wilting (Jang, 1984; Liu et al., 2003; Shen, 1984), at least through the eyes of the artists. Looking at the paintings of beauties through Chinese Ages, Jang (1984) and Shen (1984) illustrated that most of the paintings showed women's looks were thin, delicate, tender and sentimental except in the Tang dynasty (618A.D. - 907A.D.). For instance, the earliest existing silk painting in Zhou dynasty (1045B.C. - 221B.C.) painted a women with a tiny waist (Shen, 1984). Additionally, artists preferred painting the fragile beauty for women since people especially appreciated the frail women. Therefore, Xi-Shi and Lin, Dai-Yu (a main character with frail image in a famous Chinese novel: Dream of the red chamber) became synonymous with beauty (Jang, 1984).

This ideal of female aestheticism espoused in the representation of the fragile and wilting 'Oriental Beauty' is still an engrained pattern of thought among many women in contemporary Chinese culture. A recent survey for 'Sport for All' with large samples (about 6,000) in China illustrated that 24% of women regarded frailty as beautiful and this was also one of the reasons for not engaging in physical activity among women (China General Administration of Sport, 1998). This is in agreement with this research (Chapter 7), indicating that girls did not want to be too muscular. Study 4 (Chapter 7) also revealed that the historical Chinese woman with frail image (e.g. Xi-Shi, Lin, Dai-Yu) was considered to be the ideal female image among some Taiwanese adolescent girls.

(2) Male ideal image in Chinese culture

In recent years, studies examining male body image has shown an increase, parallel to the research focus on female body image (Cohane & Pope, 2001; Hargreaves et al., 2006; McCabe & Ricciardelli, 2004; Yang et al., 2005). The findings from two reviewed studies on boys' body image revealed that a substantial number of boys were dissatisfied with their body (Cohane et al., 2001; McCabe et al., 2004). Although boys showed less body dissatisfaction than girls, McCabe and Ricciardelli (2004) suggested that 'if questions related to wanting to be larger and more muscular, as well as being smaller were included as options, there may be fewer differences between adolescent boys and girls in their levels of body dissatisfaction' (p 680). Most measures of male body dissatisfaction in quantitative studies do not distinguish between increased size resulting from muscularity or fatness; hence, it is not clear whether these boys wish to be bulkier or more muscular (Cohane et al., 2001; McCabe et al., 2004). Fitness and muscularity are important for masculinity in Western society (Yang et al., 2005). In a qualitative study, Australian adolescent boys identified a toned, muscular and strong body as their ideal (Hargreaves et al., 2006). However, muscularity 'is not a prime criterion for defining a Chinese man as masculine, admirable, or desirable, whereas the body has greater importance in defining an American man in these ways' (p 266) (Yang et al., 2005). In traditional Chinese culture, masculinity includes 'Wen' (the literary or civilised) and 'Wu' (the martial). The former represents a mental character with one having literary and

cultural attainment. The latter symbolises a physical concept with meanings of martial skill and power. And the 'Wen' masculinity has been more highly valued in Chinese culture (Larson, 2002; Louie & Edwards, 1995; Yang et al., 2005).

This research found that for all boys, about one third of them wanted to be bigger and among the normal/underweight boys, around half of them wished to be bigger (Chapter 6). The measure used in this research could not distinguish 'bigness' between increased muscle and fat. Therefore, it is unable to identify whether the desire for a bigger body size meant wishing to be bulkier or more muscular among Taiwanese boys.

In sum, Taiwan is 'a stronghold of traditional Chinese culture' (p 52) (Offer et al., 1988) and is also becoming more westernised and adopting western values and norms. The drive for thinness for females is part of Westernisation (Lam et al., 2002; Lee et al., 1996; Sands et al., 2003; Shih et al., 2002). Rieger et al. (2001) pointed out that 'the processes of adopting Western attitudes toward the body is likely to be facilitated if the new values system is compatible with existing cultural values' (p 211-212). Thus, both traditional Chinese and Western values might combine to produce pressures for extremely thin ideals and this may result in high body dissatisfaction for Taiwanese girls, especially when obesity and weight gain are on the rise. This research and other Taiwanese studies have given support for this notion (Page et al., 2005; Wong et al., 2000). Therefore, it may be considered that Chinese cultures share with Western cultures an ideology that values thinness for girls. On the other hand, the traditional Chinese ideal image for men somewhat differs from the Western ideal. It remains unclear that whether the traditional value of 'Wen' masculinity could help to resist the Western influences and prevent Taiwanese boys from driving for muscularity. Further research is required to examine the Chinese ideal image for men and whether it has been influenced by the Western culture with a focus on muscularity.

8.2.3 Body dissatisfaction, physical activity and weight loss behaviour

Is body dissatisfaction a motivator for physical activity engagement to weight loss behaviour?

Although this research could not identify whether the desire to be bigger in boys was due to muscularity or not, it demonstrated that an increasing prevalence of overweight and obesity and a high proportion of boys (49.7%) and girls (73.7%) wanted to be thinner. Then, could body dissatisfaction serve as a motivation to engage in healthy physical activity behaviours for weight loss among Taiwanese adolescents?

Physical activity is acknowledged to play an important role in the prevention of obesity and in health promotion during adolescence (Goran et al., 1999; Hohepa et al., 2006; Janssen et al., 2005). Increasing activity is associated with better health even in those already fat as study 1 showed that the overweight/obese-fit adolescents are at lower risk than the overweight/obese-unfit adolescents. Furthermore, researchers suggested that a focus on physical activity rather than diet might be a more appropriate strategy for reduction of overweight in children and adolescents, since reduced intake might danger growth and addressing dieting seriously in children and adolescents might intensify the risk of introducing eating disorders (Goran et al., 1999; Neumark-Sztainer, Wall, Guo et al., 2006).

However, results from this research illustrated that less than one third of adolescents was sufficiently active for the optimal health benefits and activity is not generally used by adolescents to improve weight status even when they are dissatisfied with their body. Study 3 showed that almost all of the overweight/obese boys (92.8%) and girls (100%) desired to be thinner, whereas only 29.6% of boys and 51.5% of girls did act to lose weight. Study 4 revealed that insecurity about body appearance and physical complaints (exhausting, difficult to breathe, sweating) were the main barriers for the overweight/obese girls for physical activity engagement. Additionally, the overweight/obese girls were aware that weight status is difficult to change and this awareness might also contribute to no action for weight loss behaviour. Nevertheless, the reasons for the other subgroups might differ. Further research is required.

All in all, obesity and a physically inactive lifestyle are two of the most prevalent risk factors for common chronic diseases (Bouchard, 2000). Obesity arises from an imbalance between energy intake and expenditure (Daniels et al., 2005) and a physically inactive lifestyle is a risk factor for weight gain. By adolescence the problem is particularly intractable if overeating is coupled with a lack of physical activity (Kohn et al., 2006; Whitaker et al., 1997), since adolescence is the life stage when individuals begin to formulate their health-related habits, setting patterns that continue into adulthood (Harris et al., 2003). Unhealthy behaviours such as unhealthy dietary behaviours and physical inactivity are interrelated and often are established during childhood and adolescence and extend into adulthood (Department of Health and Human Services Centers for Disease Control and Prevention, 2006). Furthermore, adolescence also marks the stage of rapid physical development when notions of an ideal body image become especially salient in young people's lives as they develop self-conceptions of their own body image (Harris et al., 2003). Particularly, overweight/obese adolescent girls represent a population with high concern about body image, which may impact on specific determinants of physical activity (McConnell, 1998). Therefore, highlighting the obesity problem in prevention programs in adolescents is likely to produce the adverse effect of making obese individuals more sensitive about their weight, and thus making them less likely to participate in physical activity (O'dea, 2004, 2005). Study 4 has identified body consciousness as a primary hindrance to physical activity for girls and this might reduce their participation in physical activity. As a result, efforts are required to emphasise the enjoyment of physical activity and promote the important message that fat people could be fit and healthy as found in study 1. As Brodney, et al. (2000) suggested 'the public health would be better served with more comprehensive attempts to increase population levels of physical activity, rather than emphasizing ideal weight ranges and raising an alarm about increasing prevalence rates of obesity' (p 367-368). This is especially true for adolescents with great sensitivity to weight related issues.

8.3 Strengths and limitations

Strengths

In addition to the strengths that have been sporadically discussed within each study, the following could be further drawn across studies in this research:

- This research provides a first step towards identifying effective and practical measures of adolescent health and related behaviours across obesity, physical activity, weight control, and body dissatisfaction. It incorporates both qualitative and quantitative approaches with three different methods and offers a cross-sectional examination of adolescents' body image placed in a broader context of factors.

- Three quantitative studies provide information on obesity prevalence, physical activity patterns, weight control behaviour, body dissatisfaction prevalence, and the relationships between obesity, physical activity and body dissatisfaction among Taiwanese adolescents of both genders. The large and representative samples give more reliable data for understanding the current prevalence in these variables as well as the associations. The findings could provide a baseline for future comparisons and preliminary identifications of subgroups at higher risk of obesity, physical inactivity, and body dissatisfaction among Taiwanese adolescents.

- The qualitative study offers a map of the body image concerns and motivations/barriers of physical activity participation in Taiwanese overweight and obese adolescent girls. The deep and broad information gained from the interviews might give an appropriate basis for physical activity promotions and interventions among overweight/obese adolescents in Taiwan.

- Additionally, the research provides findings on obesity and health-related behaviours among Taiwanese adolescents, complementing the existing focus on Western populations.

- It also gives a more full and deep exploration of the cultural uniqueness of body image, supplying a more sophisticated cultural perspective on body image,

where the traditional Chinese ideal body preferences are given attention through the history.

Limitations

Although these strengths contribute to the uniqueness and utility of the findings, research limitations also need to be taken into consideration in interpreting the results.

- A fundamental drawback is the four studies performed in this research are cross-sectional and it is difficult to determine the role played by obesity and physical activity in the development of body dissatisfaction.
- Then, data from three out of four studies in this research are subjected to the problems inherent in self-reporting. The extent of underreporting or overreporting of behaviours (e.g. physical activity, unhealthy weight loss methods) cannot be determined.
- Finally, BMI is not a perfect measurement since it does not distinguish between weight from fat and weight from muscle, although it is correlated with body fat (Harris et al., 2003; Olmsted & McFarlane, 2004). It might not provide an adequate measure of adiposity among adolescents with high levels of muscle mass and misclassified them as overweight or obese, though it is a suitable measure of weight status for epidemiological studies.

8.4 Suggestions for further research

Among the many topics to be explored in future research, some possible issues could be listed as follows:

- Before the government develops a plan of action and invests too much in specific strategies, further research is required. A better and regular national surveillance in obesity, physical activity, weight control, and other health related behaviours would be the first step. Improving the quality of national surveys should be an important issue. National surveys on obesity (weight and height)

and fitness have been assessed objectively with representative samples. However, there is in need of an adequate measure of adiposity to distinguish between weight from fat and weight from muscle, such as waist circumference, skinfolds, dual energy x-ray absorptiometry (DXA). Furthermore, objective measures of physical activity are warranted. It is important to get better data on the prevalence, patterns, and changes of physical activity and obtain more understanding on how to increase levels of physical activity (Adersen & van Mechelen, 2005). Different types of sedentary behaviours (inactivity) also need to be measured specifically. Distinguishing academically-relevant sedentary behaviours (e.g. studying) from recreational sedentary behaviours (e.g. TV viewing) might help to better understand the relationships between sedentary behaviour, physical activity, and obesity.

- Additional research focusing on childhood and adolescent obesity should be considered. Particularly, factors influencing the risk of becoming overweight or obese such as eating habits and life style require further investigation to prevent or reduce the increasing prevalence of overweight and obesity among children and adolescents.

- Motivations and barriers of physical activity participation might differ from gender, age or BMI-group. This research revealed that older girls are the least active and overweight/obese girls reported body consciousness being the most strong motivation and barrier for physical activity engagement. Boys or normal individuals might show different experiences. Therefore, studies for exploring physical activity experiences among different subgroups could be conducted to help in developing more effective physical activity interventions.

- This research illustrated that body dissatisfaction varies between genders and BMI-groups. While the levels of body dissatisfaction might be influenced by various factors, future studies could further examine with other factors, such as individual personality, parental support, peer relationship, et al..

- The ideal body image appears to differ between genders among adolescents, boys and girls reporting different preferences of ideal body shape. Boys' dissatisfaction potentially could develop from two directions including a desire to be thinner and bigger, differing from the drive for thinness found in girls. Further exploring the body image and social pressure of body ideal perceived by adolescent boys could be undertaken, since this present piece of research focused mainly on adolescent girls.

- Finally, as this research only provides cross-sectional results, longitudinal research is necessary to elucidate the effects of obesity, physical activity on body image among adolescents.

8.5 Implications of this research for future policy and practice

This research provides findings on the prevalence of obesity, physical activity and body dissatisfaction and in depth information about ideal female image from adolescents' perspective. These carry implications for the literature on previous research and have relevance for policy and decision-makers in designing education projects and health promotion.

- First, efforts should be made to address the growing prevalence of overweight/obesity among the children and adolescents. Owing to the long-term risks for children and adolescent health, actions should be taken to prevent obesity in early life. Trends in overweight and obesity should be monitored continuously. Further studies are needed to focus on reasons for the increase and efforts should be made to lower the prevalence, especially in boys during childhood range.

- Then, interventions are needed to promote physical activity and improve physical fitness among the young population, since fitness is associated with better health in various BMI-groups for children and adolescents. Research is required to elucidate the most effective methods to help the youth become or

maintain being physically active without focusing on weight loss or body appearance, particularly in older adolescent girls.

- Positive body image should be encouraged, which is especially important for girls who adopt unhealthy methods to achieve the unrealistic thin ideal. For example, students should be offered knowledge about the normative pubertal development and be taught to view the body image message with a critical eye, such as the media images not representing a variety of shapes, thinness doesn't equal attractiveness, current body shape is fashionable just at this moment in time and place, the ideal body shape changes throughout history and between cultures, et al. (Durkin et al., 2005). Providing students with a broader perspective on body image might help them decrease the impact of the pressure to be thin. This information could also be incorporated into various classes throughout the education.

- Peer experiences including 'fat talk' and 'teasing' have significant connections to body image for adolescents (Jones et al., 2004), which are important issues to address. Educators should be aware of the fact that peers might treat obese individuals in a negative manner owing to their weight. This research has shown that boys' teasing and the normal weight or thin girls' fat talk link to body dissatisfaction for the overweight/obese girls and adds pressure for them to engage in weight loss behaviours. Therefore, making weight prejudice unacceptable and decreasing in discussions about weight among peers might reduce body dissatisfaction and schools might be particularly good avenues of dissemination (Littleton et al., 2003; Olmsted et al., 2004).

- Detailed information of adolescent girls' attitudes toward obesity, self image and weight control behaviour found in this research should inform more sensitive and successful interventions. Interventions should aim at helping adolescents to reduce the internalisation of the socio-cultural ideal of thinness (Keery et al., 2004) and develop healthy eating and exercise behaviours. However, more studies are also warranted to examine the extreme pressure of thinness that adolescents face and their risk for engaging in unhealthy weight control behaviours.

- Interventions should be approached differently by various subgroups. Different genders, age groups, or weight status groups vary in the levels of body dissatisfaction and might response differently to various interventions (Littleton et al., 2003). For example, interventions could target stress management and self-esteem enhancement for obese girls with high levels of body dissatisfaction.

REFERENCES

Aarnio, M., Winter, T., Kujala, U., & Kaprio, J. (2002). Associations of health related behaviour, social relationships, and health status with persistent physical activity and inactivity: a study of Finnish adolescent twins. *Br J Sports Med, 36*, 360-364.

Abbott, R. A., Harkness, M. A., & Davies, P. S. W. (2002). Correlation of habitual physical activity levels with flow-mediated dilation of the brachial artery in 5-10 year old children. *Atherosclerosis, 160*(1), 233-239.

Abrams, L. S., & Stormer, C. C. (2002). Sociocultural variations in the body image perceptions of urban adolescent females. *Journal of Youth and Adolescence, 31*(6), 443-456.

Ackard, D. M., & Perterson, C. B. (2001). Association between puberty and disordered eating, body image, and other psychological variables. *Int J Eat Disord, 29*, 187-194.

Adersen, L. B., & van Mechelen, W. (2005). Are children of today less active than before and is their health in danger? What can we do? *Scand J Med Sci Sports, 15*, 268-270.

Alpert, B. S., & Wilmore, J. H. (1994). Physical activity and blood pressure in adolescents. *Pediatr Exerc Sci, 6*, 361-380.

American Association of University Women. (1994). *Shortchanging girls, shortchanging American*: American Association of University Women.

American College of Sports Medicine. (2003). *ACSM fitness book* (3rd ed.). Champaign: Human Kinetics.

American Express. (2004). *Winners of Miss American*. American Express. Available: http://www.pbs.org/wgbh/amex/missamerica/sfeature/sf_list.html [2004, 13 August].

Anspaugh, J. R. (2001, 04/October/2001). *Fat like US: history of body image in Western culture*. Available: http://www.fatlikeus.com/weighsdetail.asp?ID=44 [2004, 24 September].

Anton, S. D., Perri, M. G., & Riley, J. R. (2000). Discrepancy between actual and ideal body images impact on eating and exercise behaviors. *Eating Behaviors, 1*, 153-160.

Armstrong, N., & Simons-Morton, B. (1994). Physical activity and blood pressure in adolescents. *Pediatr Exerc Sci, 6*, 381-405.

Australia Institute of Health and Welfare. (2003). *Australia's young people: their health and well-being 2003*: Australia Institute of Health and Welfare.

Bailey, D. A., & Martin, A. D. (1994). Physical activity and skeletal health in adolescents. *Pediatr Exerc Sci, 6*, 361-380.

Baker, C. W., & Brownell, K. D. (2000). Physical activity and maintenance of weight loss: physiological and psychological mechanisms. In C. Bouchard (Ed.), *Physical activity and obesity* (pp. 311-328). Champaign: Humman Kinetics.

Bandura, A. (1977). *Social learning theory*. New Jersey: Prentice-Hall.

Bane, S. (1998). Body image and exercise. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 311-322). Morgantown, WV: Fitness Information Technology.

Baquet, G., Praagh, E. V., & Berthoin, S. (2003). Endurance training and aerobic fitness in young people. *Sports Med, 33*(15), 1127-1143.

Bar-Or, O., & Baranowski, T. (1994). Physical activity and obesity among adolescents. *Pediatr Exerc Sci, 6*, 348-360.

Baranowksi, M. J., Jorga, J., Djordjevic, I., Marinkovic, J., & Hetherington, M. M. (2003). Evaluation of adolescent body satisfaction and associated eating disorder pathology in two communities. *European Eating Disorders Review, 11*(6), 478-495.

Barker, E. T., & Galambos, N. L. (2003). Body dissatisfaction of adolescent girls and boys: Risk and resource factors. *Journal of Early Adolescence, 23*(2), 141-165.

Berardi, K. L. (2003). *Body image and exercise- the role of eating pathology, internalisation, and self-efficacy.* Unpublished Master, University of Windsor, Canada.

Bezner, J. R., Adams, T. B., & Steinhardt, M. A. (1997). Relationship of body dissatisfaction to physical health and wellness. *American Journal of Health Behavior, 21*, 147-155.

Biddle, S., Cavill, N., & Sallis, J. (1998). Policy framework for young people and health : enhancing physical activity. In S. Biddle & J. Sallis & N. Cavill (Eds.), *Young and active? young people and health : enhancing physical activity - evidence and implications* (pp. 3-16): London: Health Education Authority.

Biddle, S. J. H., Whitehead, S. H., O'Donovan, T. M., & Nevill, M. E. (2005). Correlates of participation in physical activity for adolescent girls: A systematic review of recent literature. *JPAH, 2*(4), 423-434.

Blair, S. N., Kampert, J. B., Kohl 3rd, H. W., Barlow, C. E., Macera, C. A., Paffenbarger, R. S., & Gibbons, L. W. (1996). Influences of cardioreapiratory fitness and other precursors on cardiovascular disease and all-cause mortality in men and women. *JAMA, 276*, 205-210.

Blair, S. N., Kohl 3rd, H. W., Paffenberger, R. S., Clark, D. G., & Gibbons, L. W. (1989). Physical fitness and all-cause mortality: A prospective study of healthy men and women. *JAMA, 262*(17), 2395-2401.

Blascovich, J., & Tomaka, J. (1991). Measures of self-esteem. In J. P. Robinson & P. R. Shaver & L. S. Wrightsman (Eds.), *Measures of personality and social psychological attitudes*. San Diego: Academic Press.

Boreham, C. A., Twisk, J., Savage, M. J., Cran, G. W., & Strain, J. J. (1997). Physical activity, sports participation, and risk factors in adolescents. *Med Sci Sports Exerc, 29*(6), 788-793.

Bosco, J. S., & Gustafson, W. F. (1983). *Measurement and evaluation in physical education, fitness, and sports* New Jersey: Prentice-Hall.

Botta, R. A. (2003). For your health? The relationship between magazine reading and adolescents' body image and eating disturbances. *Sex Roles, 48*(9-10), 389-399.

Botticelli, S. (Artist). (1482). *The Birth of Venus* [Painting].

Bouchard, C. (2000). *Physical activity and obesity*. Champaign: Human Kinetics.

Brodney, S., Blair, S. N., & Lee, C. D. (2000). Is it possible to be overweight or obese and fit and healthy? In C. Bouchard (Ed.), *Physical activity and obesIty* (pp. 355-371). Champaign: Human Kinetics.

Bruch, H. (1980). Preconditions for the development of anorexia nervosa. *Am J Psychoanal, 40*(2), 169-172.

Bryman, A. (2001). *Social research methods*. New York: Oxford University Press.

Burke, V., Beilin, L. J., Dunbar, D., & Kevan, M. (2004). Associations between blood pressure and overweight defined by new standards for body mass index in childhood. *Prev Med, 38*, 558-564.

Byrne, A., & Byrne, D. G. (1993). The effect of exercise on depression, anxiety and other mood states: a review. *J Psychosom Res, 37*(6), 565-574.

Calderon, K. S., Yucha, C. B., & Schaffer, S. D. (2005). Obesity-related cardiovascular risk factors: intervention recommendations to decrease adolescent obesity. *J Pediatr Nurs, 20*(1), 3-14.

Calfas, K. J., & Taylor, W. C. (1994). Effects of physical activity on psychological variables in adolescents. *Pediatr Exerc Sci, 6*, 406-423.

Camp, D. E., Klesges, R. C., & Relyea, G. (1993). The relationship between body weight concerns and adolescent smoking. *Health Psychol, 12*(1), 24-32.

Canada Teachers' Federation. (1990). *A cappella: a report on the realities, concerns, expectations and barriers experienced by adolescent women in Canada.* Canada: Canada Teachers' Federation.

Canadian Fitness and Lifestyle Research Institute. (2002). *Increasing physical activity: supporting an active workforce*: Canada: Canadian Fitness and Lifestyle Research Institute.

Caradas, A. A., Lambert, E. V., & Charlton, K. E. (2001). An ethnic comparison of eating attitudes and associated-body image concerns in adolescent South African schoolgirls. *Journal of Human Nutrition and Dietetics, 14*(2), 111-120.

Cardon, G., De Bourdeaudhuij, I., De Clercq, D., Philippaerts, R., Verstraete, S., & Geldhof, E. (2004). Physical fitness, physical activity, and self-reported back and neck pain in elementary schoolchildren. *Pediatr Exerc Sci, 16*(2), 147-157.

Cash, T. F. (1990). The psychology of physical appearance: aesthetics, attributes, and images. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: development, deviance, and change* (pp. 51-79). New York: The Guilford Press.

Cash, T. F., Novy, P. L., & Grant, J. R. (1994). Why do women exercise? factor analysis and further validation of the reasons for exercise inventory. *Percept Mot Skills, 78*(2), 539-544.

Cash, T. F., & Pruzinsky, T. (2002). Understanding body image: Historical and contemporary perspectives. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: a handbook of theory, research, and clinical practice* (pp. 3-12). New York: The Guilford Press.

Cash, T. F., & Pruzinsky, T. (Eds.). (1990). *Body images: development, deviance, and change*. New York: The Guilford Press.

Chang, C. H. (1994). *Modern psychology*. Taipei: Tung Hua.

Chang, H. Y., Chiou, C. J., Lin, M. C., Lin, S. H., & Tai, T. Y. (2005). A population study of the self-care behaviors and their associated factors of diabetes in Taiwan: results from the 2001 National Health Interview Survey in Taiwan. *Prev Med, 40*(3), 344-348.

Chen, C. H. (1999). *Taiwanese old sayings*. Taipei: Chien Wei.

Chen, H.-s. (Artist). (1639). *2nd Portrait of Chiao-Niang* [Painting].

Chen, L.-J., Fox, K. R., Haase, A. M., & Wang, J.-M. (2006). Obesity, fitness and health in Taiwanese children and adolescents. *Eur J Clin Nutr, 60*(12), 1367-1375.

Chen, W. (1998). Chinese and American college students' motives for participation in physical activities. *Percept Mot Skills, 87*(3), 1463-1470.

Chen, W., Lin, C. C., Peng, C. T., Li, C. I., Wu, H. C., Chiang, J., Wu, J. Y., & Huang, P. C. (2002). Approaching healthy body mass index norms for children and adolescents from health-related physical fitness. *Obes Rev, 3*, 225-232.

Chen, W., & Swalm, R. L. (1998). Chinese and American college students' body-image: perceived body shape and body affect. *Percept Mot Skills, 87*(2), 395-403.

Chen, W., Wu, K. W., Mi, L. L., & Liu, J. L. (1993). Weight-for-length index in evaluation of children's body weight status: a simple and accurate method. *J Formos Med Assoc (Taiwan), 92*(Suppl: 3), S128-S134.

Chenskin, L. J., & Donze, L. F. (2001). Appearance vs Health as motivator for weight loss. *JAMA, 286*(17), 2160.

Chiao, P.-c. (Artist). (1689-1726). *Court Ladies*

China General Administration of Sport. (1998). *Sport for All*. BeiJing: BeiJing Sport University.

Christodoulos, A. D., Flouris, A. D., & Tokmakidis, S. P. (2006). Obesity and physical fitness of pre-adolescent children during the academic year and the summer period: effects of organized physical activity. *J Child Health Care, 10*(3), 199-212.

Chu, N., Rimm, E. B., Wang, D., Liou, H., & Shieh, S. (1998). Clustering of cardiovascular disease risk factors among obese schoolchildren: The Taipei Heart Study. *Am J Clin Nutr, 67*, 1141-1146.

Chu, N. F. (2001). Prevalence and trends of obesity among school children in Taiwan - The Taipei Children Heart Study. *Int J Obes, 25*, 170-176.

Chu, N. F. (2004). *Prevalence of obesity in Taiwan.* Paper presented at the Symposium on Nutrition Monitoring and Health Policy Development, Taiwan.

Chu, N. F. (2005). Prevalence of obesity in Taiwan. *Obes Rev, 6*, 271-274.

Clay, D., Vignoles, V. L., & Dittmar, H. (2005). Body image and self-esteem among adolescent girls: Testing the influence of sociocultural factor. *J Res Adolesc, 15*(4), 451-477.

Cohane, G. H., & Pope, H. G. (2001). Body image in boys: A review of the literature. *Int J Eat Disord, 29*, 373-379.

Colchico, K., Zybert, P., & Basch, C. E. (2000). Effects of after-school physical activity on fitness, fatness, and cognitive self-perceptions: a pilot study among urban minority adolescent girls. *Am J Public Health, 90*(6), 977-978.

Cole, T. J. (2006). Childhood obesity: assessment and prevalence. In N. Cameron & N. G. Norgan & G. T. H. Ellison (Eds.), *Childhood obesity: contemporary issues* (pp. 3-12). London: Taylor & Francis.

Cole, T. J., Bellizzi, M. C., Flegal, K. M., & Dietz, W. H. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ, 320*, 1240-1243.

Courbet, G. (Artist). (1868). *La Source (The Source)* [Painting].

Crago, M., Shisslak, C. M., & Estes, L. S. (1996). Eating disturbances among American minority groups: A review. *Int J Eat Disord, 19*(3), 239-148.

Craig, C. L., Marshall, A. L., Sjostrom, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J. F., & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc, 35*(8), 1381-1395.

Creswell, J., W. (2003). *Research design: qualitative, quantitative and mixed methods with approaches* (2nd ed.). California: Sage.

Creswell, J. W., Plano Clark, V. L., Gutmann, M. L., & Hanson, W. E. (2003). Advanced mixed methods research design. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in socail and behavioral research* (pp. 209-240). California: Sage.

Crews, D. J., Lochbaum, M. R., & Landers, D. M. (2004). Aerobic physical activity effects on psychological well-being in low-income Hispanic children. *Percept Mot Skills*, 98(1), 319-324.

Croll, E. (1995). *Changing Identities of Chinese women*. Hong Kong: Hong Kong University Press.

Daniels, S. R., Arnett, D. K., Eckel, R. H., Gidding, S. S., Hayman, L. L., Kumanyika, S., Robinson, T. N., Scott, B. J., Jeor, S. S., & Williams, C. L. (2005). AHA Scientific Statement: Overweight in children and adolescents pathophysiology, consequences, prevention, and treatment. *Circulation, 111*, 1999-2012.

Davis, C. (1997a). Body image, exercise and eating behaviours. In K. R. Fox (Ed.), *The physical self: from motivation to well-being* (pp. 143-174). Champaign: Human Kinetics.

Davis, C. (1997b). Normal and neurotic perfectionism in eating disorders: an interactive model. *Int J Eat Disord, 22*(4), 421-426.

Davis, C., & Fox, J. (1993). Excessive exercise and weight preoccupation in women. *Addict Behav, 18*(2), 201-211.

Davis, C., & Katzman, M. A. (1998). Chinese men and women in the United States and Hong Kong: body image and self-esteen rating as a prelude to dieting and exercise. *J Psychosom Res, 49*, 199-205.

Davis, C., & Katzman, M. A. (1999). Perfection as Acculturation: Psychological Correlates of Eating Problems in Chinese Male and Female Students Living in the United States. *Int J Eat Disord, 25*, 65-70.

Deforche, B., Lefevre, J., De Bourdeaudhuij, I., Hills, A. P., Duquet, W., & Bouckaert, J. (2003). Physical fitness and physical activity in obese and nonobese Flemish youth *Obes Res, 11*(3), 434-441.

Deforche, B. I., De Bourdeaudhuij, I. M., & Tanghe, A. P. (2006). Attitude toward physical activity in normal-weight, overweight and obese adolescents. *J Adolesc Health, 38*(5), 560-568.

Department of Health and Human Service. (2001). *Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*: US Department of Health and Human Service, Public Health Servise, Office of the Surgeon General.

Department of Health and Human Services. (1996). *Physical activity and health: a report of the Surgeon General*: U.S. Department of Health and Human Services.

Department of Health and Human Services. (2004). *Body wise Handbook: eating disorders information for middle school personnel (3rd)*: U.S. Deportment of Health and Human Services, Office on Women's Health.

Department of Health and Human Services Centers for Disease Control and Prevention. (2004). *Youth Risk Behavior Surveillance-United States, 2003*: U.S. Department of Health and Human Services: Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report.

Department of Health and Human Services Centers for Disease Control and Prevention. (2006). *Youth Risk Behavior Surveillance-United States, 2005*: U.S. Department of Health and Human Services: Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report.

Dietz, W. H. (1998). Health consequences of obesity in youth: childhood predictors of adult disease. *Pediatrics, 101*(3), 518-525.

Duncan, M. J., & Al-Nakeeb, Y. (2004). Body image and physical activity in British secondary school children. *European Physical Education Review, 10*(3), 243-260.

Durkin, S. J., & Paxton, S. J. (2002). Predictors of vulnerability to reduced body image satisfaction and psychological well-being in response to exposure to idealized female media images in adolescent girls. *J Psychosom Res, 53*(5), 995-1005.

Durkin, S. J., Paxton, S. J., & Wertheim, E. H. (2005). How do adolescent girls evaluate body dissatisfaction prevention messages? *J Adolesc Health, 37*(5), 381-390.

Dusek, J. B. (1996). *Adolescent development & behavior* (3rd ed.). New Jersey: Prentic-Hall.

Eating Disorders Support. (2002, 30 July 2002). *A brief history of female body fashions*. Eating Disorders Support. Available: http://www.cusu.cam.ac.uk/campaigns/eds/femalebody.htm [2004, 24 September].

Edmunds, L., Waters, E., & Elliott, E. J. (2001). Evidence based paediatrics: Evidence based management of childhood obesity. *BMJ, 323*, 916-919.

Eisenberg, M. E., Neumark-Sztainer, D., Haines, J., & Wall, M. (2006). Weight-teasing and emotional well-being in adolescents: longitudinal findings from Project EAT. *J Adolesc Health, 38*(6), 675-683.

Eisenmann, J. C., Bartee, R. T., & Wang, M. Q. (2002). Physical activity, TV viewing, and weight in U.S. Youth: 1999 Youth Risk Behavior Survey. *Obes Res, 10*(5), 379-385.

Ekeland, E., Heian, F., Hagen, K. B., Abbott, J., & Nordheim, L. (2004). *Exercise to improve self-esteem in children and young people. The Cochrane Database of Systematic Reviews 2004, Issue 1. Art. No.: CD003683. DOI: 10.1002/14651858.CD003683.pub2.*

Ekelund, U., Åman, J., Yngve, A., Renman, C., Westerterp, K., & Sjöström, M. (2002). Physical activity but not energy expenditure is reduced in obese adolescents: a case-control study. *Am J Clin Nutr, 76*(5), 935-941.

Eklund, R. C., & Crawford, S. (1994). Active women, social physique anxiety, and exercise. *Journal of Sport and Exercise Psychology, 16*(4), 431-448.

Eliakim, A., & Beyth, Y. (2003). Exercise training, menstrual irregularities and bone development in children and adolescents. *J Pediatr Adolesc Gynecol, 16*, 201-206.

Eliakim, A., Brasel, J. A., Mohan, S., Barstow, T. J., Berman, N., & Cooper, D. M. (1996). Physical fitness, endurance training, and the growth hormone-insulin-like growth factor I system in adolescent females. *J Clin Endocrinol M, 81*(11), 3986-3992.

Eliakim, A., Raisz, L. G., Brasel, J. A., & Cooper, D. M. (1997). Evidence for increased bone formation following a brief endurance-type training intervention in adolescent males. *J Bone Miner Res, 12*(10), 1708-1713.

Emma, R. S., & Jane, W. (2003). Internalisation of ideal body shapes in 9-12 -year-old girls. *Int J Eat Disord, 33*, 193-204.

Erikson, E. H. (1963). *Childhood and society (2nd ed.)*. New York: Norton.

Ewart, C. K., Young, D. R., & Hagberg, J. M. (1998). Effects of school-based aerobic exercise on blood pressure in adolescent girls at risk for hypertension. *Am J Public Health, 88*(6), 949-951.

Faith, M. S., Matz, P. E., & Allison, D. B. (2003). Psychological correlates and consequences of obesity. In R. E. Andersen (Ed.), *Obesity etiology assessment, treatment, and prevention* (pp. 17-31). Champaign: Human Kinetics.

Farrell, C., Shafran, R., & Fairburn, C. G. (2004). Mirror cognitions and behaviours in people concerned about body shape. *Behavioural and Cognitive Psychotherapy, 32*(2), 225-229.

Feldman, D. E., Barnett, T., Shrier, I., Rossignol, M., & Abenhaim, L. (2003). Is physical activity differentially associated with different types of sedentary pursuits? *Arch Pediatr Adolesc Med, 157*, 797-802.

Ferron, C., Narring, F., Cauderay, M., & Michaud, P. A. (1999). Sport activity in adolescence: associations with health perceptions and experimental behaviours. *Health Educ Res, 14*(2), 225-233.

Field, A. (2005). *Discovering statistics using SPSS* (2nd ed.). London: SAGE.

Field, A. E., Camargo, C. A., Taylor, C. B., Berkey, C. S., Roberts, S. B., & Colditz, G. A. (2001). Peer, parent, and media influences on the development of weight concerns and frequent dieting among preadolescent and adolescent girls and boys. *Pediatrics, 107*(1), 54-60.

Field, A. E., Cheung, L., Wolf, A. M., Herzog, D. B., Gortmaker, S. L., & Colditz, G. A. (1999). Exposure to the mass media and weight concerns among girls. *Pediatrics, 103*(3), e36.

Field, L. F. (2002). *The body image experience of adolescent females: body image development and the influences of self-efficacy.* Unpublished PhD, George Mason University, Virginia.

Fisher, S., & Cleveland, S. E. (1958). *Body image and personality*. Princeton: Van Nostrand.

Fleiss, J. L. (1981). *Statistical methods for rates and proportions* (2nd ed.). New York: John Wiley & Sons.

Fox, K. R. (1997). The physical self and processes in self-esteem development. In K. R. Fox (Ed.), *The physical self: from motivation to well-being* (pp. 111-140). Champaign: Human Kinetics.

Fox, K. R., Page, A., Peters, D. M., Armstrong, N., & Kirby, B. (1994). Dietary restraint and fatness in early adolescent girls and boys. *J Adolesc, 17*, 149-161.

Franko, D. L., & Striegel-Moore, R. H. (2002). The role of body dissatisfaction as a risk factor for depression in adolescent girls. Are the differences Black and White? *J Psychosom Res, 53*, 975-983.

French, S. A., Story, M., & Perry, C. L. (1995). Self-esteem and obesity in children and adolescents: a literature review. *Obes Res, 3*, 479-490.

Fu, C., Yeh, J., Pei, D., Lin, H. H., & Lo, H. (2004). Prevalence of overweight adolescents and associated factors in Hualien city. *Tzu Chi Med J (Taiwan), 16*(5), 301-307.

Fu, W. P., Lee, H. C., Ng, C. J., Tay, Y. K., Kau, C. Y., Seow, C. J., Siak, J. K., & Hong, C. Y. (2003). Screening for childhood obesity: international vs population-specific definitions. Which is more appropriate? *Int J Obes, 27*, 1121-1126.

Fulkerson, J. A., & French, S. A. (2003). Cigarette smoking for weight loss or control among adolescents: gender and racial/ethnic differences. *J Adolesc Health, 32*(4), 306-313.

Fulton, J. E., McGuire, M. T., Caspersen, C. J., & Dietz, W. H. (2001). Interventions for weight loss and weight gain prevention among youth: current issues. *Sports Med, 31*(3), 153-165.

Fung, M. S., & Yuen, M. (2003). Body image and eating attitudes among adolescent Chinese girls in Hong Kong. *Percept Mot Skills, 96*(1), 57-66.

Furnham, A., Badmin, N., & Sneade, I. (2002). Body image dissatisfaction: gender differences in eating attitudes, self-esteem, and reasons for exercise. *J Psychol, 136*(6), 581-596.

Gardner, R. M. (2002). Assessment of body image disturbance in children and adolescents. In J. K. Thompson & L. Smolak (Eds.), *Body image, eating disorders, and obesity in youth: assessment, prevention, and treatment* (pp. 193-213). Washington: American Psychological Association.

Garner, D. M. (1991). *EDI-2: Eating disorder inventory professional manual*. Odessa, FL: Psychological Assessment Resources.

Gillen, M. M., Lefkowitz, E. S., & Shearer, C. L. (2006). Does body image play a role in risky sexual behavior and attitudes? *Journal of Youth and Adolescence, 35*(2), 243-255.

Goldberg, J. (1997). *Exercise, eating behaviours and the construction of women's self-concept:-an integrated approach.* Unpublished PhD, University of Bristol, Bristol.

Goran, M. I., Reynolds, K. D., & Lindquist, C. H. (1999). Role of physical activity in the prevention of obesity in children. *Int J Obes Relat Metab Disord, 23*(suppl 3), S18-S33.

Gordon-Larsen, P., McMurray, R. G., & Popkin, B. M. (2000). Determinants of adolescent physical activity and inactivity Patterns. *Pediatrics, 105*(6), e83.

Gordon-Larsen, P., & Popkin, B. M. (2006). Global perspectives on adolescent obesity. In N. Cameron & N. G. Norgan & G. T. H. Ellison (Eds.), *Childhood obesity: contemporary issues* (pp. 13-23). London: Taylor & Francis.

Gortmaker, S. L., Must, A., Perrin, J. M., Sobol, A. M., & Dietz, W. H. (1993). Social and Economic Consequences of Overweight in Adolescence and Young Adulthood. *N Engl J Med, 329*(14), 1008-1012.

Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis, 11*(3), 255-274.

Groesz, L. M., Levine, M. P., & Murnen, S. K. (2002). The effect of experimental presentation of thin media image on body satisfaction: a meta-analysis review. *Int J Eat Disord, 31*, 1-16.

Grogan, S. (1999). *Body image: Understanding body dissatisfaction in men, women, and children*: London: Routledge.

Grogan, S., & Wainwright, N. (1996). Growing up in the culture of slenderness: Girls experience of body dissatisfaction. *Women's Studies International Forum, 19*(6), 665-673.

Gubrium, J. F., & Holstein, J. A. (2002). *Handbook of interview research: Context and method.* London: Sage.

Guedes, D. P., Lopes, C. C., & Guedes, J. E. R. P. (2005). Reproducibility and validity of the International Physical Activity Questionnaire in adolescents. *Rev Bras Med Esporte, 11*(2), 147e-154e.

Gustafson-Larson, A. M., & Terry, R. D. (1992). Weight-related behaviors and concerns of fourth-grade children. *J Am Diet Assoc, 92*(7), 818-822.

Hargreaves, D. A., & Tiggemann, M. (2006). 'Body Image is for Girls': A qualitative study of boys' body image. *J Health Psychol, 11*(4), 567-576.

Harris, K. M., King, R. B., & Gordon-Larsen, P. (2003). *Healthy habits among adolescents: sleep, diet, exercise, and body image*. Washington, DC: Child Trends.

Harrison, K., & Cantor, J. (1987). The relationship between media consumption and eating disorders. *Journal Commun, 47*, 40-67.

Hausenblas, H. A., & Fallon, E. A. (2002). Relationship among body image, exercise behavior, and exercise dependence symptoms. *Internal Journal of Eating Disorders, 32*, 179-185.

Havighurst, R. J. (1972). *Developmental tasks and education (2nd ed.)*. New York: McKay.

Heinberg, L. J., Thompson, J. K., & Stormer, S. (1995). Development and validation of the Sociocultural Attitudes Towards Appearance Questionnaire. *Int J Eat Disord, 17*(1), 81-89.

Hermes, S., & Keel, P. K. (2003). The influence of puberty and ethnicity on awareness and internalisation of the thin ideal. *Int J Eat Disord, 33*, 465-467.

Hesse-Biber, S. (1996). *Am I thin enough?* New York:: Oxford University Press.

Hesse-Biber, S. N., Howling, S., Leavy, P., & Lovejoy, M. (2004). Racial identity of body image issues among African American adolescent girls. *The Qualitative Report, 9*(1), 49-79.

Heyward, V. H. (1991). *Advanced fitness assessment and exercise prescription.* Champaign: Human Kinetics.

Hill, A. J. (2004). *Fact sheets: The social and psychological consequences of obesity.* The Association for the Study of Obesity. Available: http://www.aso.org.uk [2005, 18 April].

Hill, A. J., Draper, E., & Stack, J. (1994). A weight on children's minds: body shape dissatisfactions at 9 years old. *Int J Obes, 18*, 383-389.

Hill, A. J., & Lissau, I. (2002). Psychosocial factors. In W. Burniat & T. J. Cole & I. Lissau & E. M. E. Poskitt (Eds.), *Child and adolescent obesity* (pp. 109-127). Cambridge: Cambridge University Press.

Hill, C. E., Nutt-Williams, E., Heaton, K. J., Thompson, B. J., & Rhodes, R. H. (1996). Therapist restrospective recall of impasses in long-term psychotherapy: a qualitative analysis. *Journal of Counseling Psychology, 43*(2), 207-217.

Hill, C. E., Thompson, B. J., & Nutt-Williams, E. (1997). A guide to conducting consensual qualitative research. *The Counseling Psychologist, 25*(4), 517-572.

Hoare, P., & Cosgrove, L. (1998). Eating habits, body-esteem and self-esteem in Scottish children and adolescents. *J Psychosom Res, 45*(5), 425-431.

Hohepa, M., Schofield, G., & Kolt, G. S. (2006). Physical activity: what do high school students think? *J Adolesc Health, 39*(3), 328-336.

Hong Kong Sports Development Board. (2001). *Sport participation Survey 2001*: Hong Kong Sports Development Board.

Hong Kong Television Broadcasts Limited. (2004). *Winners of Miss Hong Kong*. Hong Kong Television Broadcasts Limited. Available: http://misshk.tvb.com/ [2004, 13 August].

Hosmer, D. W., & Lemeshow, S. (2000). *Applied logistic regression* (2nd ed.): New York: John Wiley and Sons.

Hsiao, F. H., & Lin, W. (1998). Study of the body image and tendency of eating disorder of Taipei senior high school girls. *Journal of Health Education (Taipei), 11*, 107-127.

Hua, S. C. (Artist). (1979). *One hundred beautiful women* [painting].

Huang, Y. C., & Malina, R. M. (2002). Physical activity and health-related physical fitness in Taiwanese adolescents. *Physiol Anthropol Appl Human Sci, 21*(1), 11-19.

Huang, Y. C., & Wu, J. Y. (2000). Weight-for-height reference among school children aged 6.5 to 18.5 in Taiwan. *Public Health (Taiwan), 27*(3), 167-177.

Huang, Y. C., Wu, J. Y., & Yang, M. J. (2003). Weight-for-height reference and the prevalence of obesity for school children and adolescents in Taiwan and Fuchien Areas. *J Chin Med Assoc (Taiwan), 66*(10), 599-606.

Hui, L., & Bell, A. C. (2003). Overweight and obesity in children from Shenzhen, People Republic of China. *Health & Place, 9*(4), 371-376.

Hui, S. C. (2001). *Health and physical activity in Hong Kong- a review*: Hong Kong Sports Development Board.

Hui, S. C., Chan, C. M., Wong, S. H. S., Ha, A. S. C., & Hong, Y. (2001). Physical activity levels of Chinese youths and its association with physical fitness and demographic variables: the Hong Kong youth fitness study. *Res Q Exerc Sport, 72*(Supplement), A92-93.

International Obesity Task Force. (2000). *The Asia-Pacific perspective: redefining obesity and its treatment*: International Obesity Task Force.

International Obesity Task Force. (2002). *Obesity in the Pacific-Too big to ignore*: International Obesity Task Force Asia Pacific Office.

Jackson, L. A. (2002). Phical attractiveness: a sociocultural perspective. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: a handbook of theory, research, and clinical practice* (pp. 13-21). New York: The Guilford Press.

Jamner, M. S., Spruijt-Metz, D., Bassin, S., & Cooper, D. M. (2004). A controlled evaluation of a school-based intervention to promote physical activity among sedentary adolescent females: project FAB. *Adolesc Med, 34*, 279-289.

Jang, M.-H. (1984). Female beauty through the painting of beauty. In K.-S. Ho (Ed.), *Selected paintings of beauties through the Ages* (pp. 26-29). Taipei: ART Book Co. LTD.

Janssen, I., Katzmarzyk, P. T., Boyce, W. F., Vereecken, C., Mulvihill, C., Roberts, C., Currie, C., Pickett, W., & The Health Behaviour in School-Aged Children Obesity Working Group. (2005). Comparison of overweight and obesity

prevalence in school-aged youth from 34 countries and their relationships with physical activity and dietary patterns. *Obes Rev, 6*(2), 123-132.

Janz, K. F., Burns, T. L., Torner, J. C., Levy, S. M., Paulos, R., & Willing, M. C. (2001). Physical activity and bone measures in young children: the Iowa Bone Development Study. *Pediatrics, 107*, 1387-1393.

Janz, K. F., Dawson, J. D., & Mahoney, L. T. (2002). Increases in physical fitness during childhood improve cardiovascular health during adolescence: the Muscatine Study. *Int J Sports Med, 23*(Supplement1), S15-21.

Jhang, C. S. (1995). *Jhang's Psychological Dictionairy* (2nd ed.). Taipei: Don-Wa.

Jones, D. C., Vigfusdottir, T. H., & Lee, Y. (2004). Body image and the appearance culture among adolescent girls and boys: An examination of friend conversations, peer criticism, appearance magazines, and the internalization of appearance ideals. *Journal of Adolescent Research, 19*(3), 323-339.

Kaneko, K., Kiriike, N., Ikenaga, K., Miyawaki, D., & Yamagami, S. (1999). Weight and shape concerns and dieting behaviours among pre-adolescents and adolescents in Japan. *Psychiatry Clin Neurosci, 53*(3), 365-371.

Kawamura, K. Y. (2002). Asian American body image. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: a handbook of theory, research, and clinical practice* (pp. 243-249). New York: The Guilford Press.

Kearney-Cooke, A. (2002). Familial influences on body image development. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: a handbook of theory, research, and clinical practice* (pp. 99-107). New York: The Guilford Press.

Keats, M. R., Courneya, K. S., Danielsen, S., & Whitsett, S. F. (1999). Leisure time physical activity and psychosocial well-being in adolescents after cancer diagnosis. *J Pediatr Oncol Nurs, 16*(4), 180-188.

Keery, H., van den Berg, P., & Thompson, J. K. (2004). An evaluation of the Tripartite Influence Model of body dissatisfaction and eating disturbance with adolescent girls. *Body image, 1*(3), 237-251.

Kim, D. M., Ahn, C. W., & Nam, S. Y. (2005). Prevalence of obesity in Korea. *Obes Rev, 6*(2), 117-121.

Kim, O., & Kim, K. (2003). Comparisons of body mass index, perception of body weight, body shape satisfaction, and self-esteem among Korean adolescents. *Percept Mot Skills, 97*(3), 1339-1346.

KirKcaldy, B. D., Shephard, R. J., & Siefen, R. G. (2002). The relationship between physical activity and self-image and problem behaviour among adolescents. *Soc Psychiatry Psychiatr Epidemiol, 37*, 544-550.

Knox, S., Hess, S. A., Petersen, D. A., & Hill, C. E. (1997). A qualtative analysis of client perceptions of the effects of helpful therapist self-disclosure in long-term therapy. *Journal of Counseling Psychology, 44*(3), 274-283.

Ko, D. (1997). The body as attire: the shifting meanings of footbinding in seventeenth-century China. *Journal of Women's History, 8*(4), 9.

Kohn, M., Rees, J. M., Brill, S., Fonseca, H., Jacobson, M., Katzman, D. K., Loghmani, E. S., Neumark-Sztainer, D., & Schneider, M. (2006). Preventing and treating adolescent obesity: a position paper of the Society for Adolescent Medicine. *J Adolesc Health, 38*(6), 784-787.

Kohrt, W. M., Bloomfield, S. A., Little, K. D., Nelson, M. E., & Yingling, V. R. (2004). American College of Sports Medicine Position Stand: physical activity and bone health. *Med Sci Sports Exerc, 36*(11), 1985-1996.

Kostanski, M., Fisher, A., & Gullone, E. (2004). Current conceptualisation of body image dissatisfaction: have we got it wrong? *J Child Psychol Psychiatry, 45*(7), 1317-1325.

Kostanski, M., & Gullone, E. (1998). Adolescent body image dissatisfaction: relationships with self-esteem, anxiety, and depression controlling for body mass. *Journal Child Psychol Psychiatry, 39*(2), 255-262.

Krane, V., Waldron, J., Michalenok, J., & Stiles-Shippley, J. (2003). Body image concerns in female exercisers and athletes; a feminist cultural studies perspective. *Women in Sport and Physical Activity Journal, 10*(1), 17.

Ku, C. W. (2003). *The relationships among body dissatisfaction, social physique anxiety and eating disorder: a case study in one Taichung high school.* Unpublished Master, National Taiwan Normal University Taipei.

Kujala, U. M., Taimela, S., & Viljanen, T. (1999). Leisure physical activity and various pain symptoms among adolescents. *Br J Sports Med, 33*(5), 325-328.

Kulig, K., Brener, N. D., & McManus, T. (2003). Sexual activity and substance use among adolescents by category of physical activity plus team sports participation. *Arch Pediatr Adolesc Med, 157*, 905-912.

Lagerros, Y. T., Hsieh, S. F., & Hsieh, C. C. (2004). Physical activity in adolescence and young adulthood and breast cancer risk: a quantitative review. *Eur J Cancer Prev, 13*(1), 5-12.

Lam, T. H., Stewart, S. M., Leung, G., Ho, S. Y., Fan, A. H., & MaSex, A. L. T. (2002). Sex differences in body satisfaction, feeling fat and pressure to diet among Chinese adolescents in Hong Kong. *European Eating Disorders Review, 10*(5), 347-358.

Lan, T.-Y., Chang, H.-Y., & Tai, T.-Y. (2006). Relationship between components of leisure physical activity and mortality in Taiwanese older adults. *Prev Med, 43*(1), 36-41.

Larson, W. (2002). The self loving the self: Menand connoisseurship in modern chinese literature. In S. Brownell & J. N. Wasserstrom (Eds.), *Chinese feminities, chinese masculinities* (pp. 175-193). California: University of California Press.

Lasheras, L., Aznar, S., Merino, B., & López, E. G. (2001). Factors associated with physical activity among Spanish youth through the National Health Survey. *Prev Med, 32*, 454-464.

Latourette, K. S. (1946). *The Chinese: their history and culture* (3rd ed.). New York: The Macmillan Company.

Lau, P. W. C., Lee, A., Ransdell, L., Yu, C. W., & Sung, R. Y. T. (2003). The association between global self-esteem, physical self-concept actual vs. ideal body size rating in Chinese primary schoolchildren. *Int J Obes, 11*, 1-6.

Lee, C. D., Blair, S. N., & Jackson, A. S. (1999). Cardiorespiratory fitness, body composition, and all-cause and cardiovascular disease mortality in men. *Am J Clin Nutr, 69*, 373-380.

Lee, C. M., & Lee, M. C. (1997). Obesity in adolescents. *Healthy World (Taiwan), June*, 97-109.

Lee, K., Sohn, H., Lee, S., & Lee, J. (2004). Weight and BMI over 6 years in Korean children: relationships to body image and weight loss efforts. *Obes Res, 12*(12), 1959-1966.

Lee, L., Pan, W. H., Chen, C. H., & Lee, Y. M. (1994). The prevalence of obesity in the seven grades in Taipei city, 1991: A comparison of various body screening indices. *CJPH (Taiwan), 13*(1), 11-19.

Lee, S. (1999). Fat, fatigue and the feminine: the changing cultural experience of women in Hong Kong. *Cult Med Psychiatry, 23*(1), 51-73.

Lee, S., & Lee, A. M. (2000). Disordered eating in three communities of China: a comparative study of female high school students in Hong Kong, Schenzhen, and rural Hunan. *Int J Eat Disord, 27*(3), 317-327.

Lee, S., Leung, T., Lee, A. M., Yu, H., & Leung, C. M. (1996). Body dissatisfaction among Chinese undergraduates and its implications for eating disorders in Hong Kong. *Int J Eat Disord, 20*(1), 77-84.

Lee, V. (2003, 13 April). Creating a historical perspective on femininity. *Taipei Times,* pp. 19.

Lee, Y. M. (1995). Prevalence of obesity among high school students in Hualien city: A comparison between weight-length index and body mass index. *Chin J Fam Med (Taiwan), 5*(3), 128-135.

Leslie, J., Yancy, A., McCarthy, W., Albert, S., Wert, C., Miles, O., & James, J. (1999). Development and implementation of a school-based nutrition and fitness promotion program for ethnically diverse middle-school girls. *J Am Diet Assoc, 99*(8), 967-970.

Levin, S., Lowry, R., Brown, D. R., & Dietz, W. H. (2003). Physical activity and body mass index among US adolescents. *Arch Pediatr Adolesc Med, 157*(8), 816-820.

Levine, M. P., & Smolak, L. (2002). Body image development in adolescent. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: a handbook of theory, research, and clinical practice* (pp. 74-82). New York: The Guilford Press.

Li, K. (Artist). (1049 - 1106). *Beauties on an Outing* [Painting].

Li, S. M. (2001). *Body image*. Taipei: Hung-Jhih.

Li, Y., Hu, X., Ma, W., Wu, J., & Ma, G. (2005). Body image perceptions among Chinese children and adolescents. *Body Image, 2*(2), 91-103.

Lin, C. C., Lai, m. m., Liu, C. S., & Li, T. C. (1998). The prevalence of obesity in the school-aged children in Taichung city: A comparison of various body anthropometric indices. *Chin J Fam Med (Taiwan), 8*, 134-143.

Lin, Y. C., & Lin, W. (2000). Study of body image and dietary restraint in adolescents. *Chin J Public Health (Taipei), 19*(1), 33-41.

Littleton, H. L., & Ollendick, T. (2003). Negative body image and disordered eating behavior in children and adolescents: What places youth at risk and how can these problems be prevented? *Clin Child Fam Psychol Rev, 6*(1), 51-66.

Liu, C. W., & Huang, S. Z. (1999). Exerciose behaviour and correlates among college students in Taipei County. *School Health (Taiwan), 34*, 1-32.

Liu, F. J., & Chang, H. C. (Eds.). (2003). *Blossoming through the ages: women in Chinese art and culture from the museum collection.* Taiwan Taipei: Taiwan National Palace Museum.

Liu, Y. M. (2004). *Development and verification of validity and reliability of the International Physical Activity Questionnaire Taiwan version.* Unpublished PhD, National Taiwan University, Taipei.

Livingstone, B. (2000). Epidemiology of childhood obesity in Europe. *Eur J Pediatr, 159*(Suppl: 1), S14-34.

Lloyd, B. B., & Dittmar, H. (1997). *Girls' and boys' body image concerns*: University of Sussex.

Lobstein, T., Baur, L., & Uauy, R. (2004). Obesity in children and young people: a crisis in public health. *Obes Rev, 5*(Suppl: 1), 4-85.

Lobstein, T., & Frelut, M. L. (2003). Prevalence of overweight among children in Europe. *Obes Rev, 4*, 195-200.

Loke, K. Y. (2002). Consequences of childhood and adolescents obesity. *Asia Pacific J Clin Nutr, 11*(3), S702-S704.

Loland, N. W. (1999). *Body image and physical activity*: Norway: The Norwegian University of Sport and Physical Education.

Louie, K., & Edwards, L. (1995). Chinese masculinity: Theorizing wen and wu. *East Asian Hist, 8*, 135-148.

Lowry, R., Galuska, D. A., Fulton, J. E., Wechsler, H., & Kann, L. (2002). Weight management goals and practices among U.S. high school students: associations with physical activity, diet, and smoking. *J Adolesc Health, 31*, 133-144.

Lunner, K., Werthem, E. H., Thompson, J. K., Paxton, S. J., McDonald, F., & Halvaarson, K. S. (2000). A cross-cultural examination of weight-related teasing, body image, and eating disturbance in Swedish and Australian samples. *Int J Eat Disord, 28*(4), 430-435.

Lupinski, K. G. (2003). *Cultural differences in body image: the perspectives of European American, African American and Asian American college women.* Unpublished EdD, University of Cicinnati, Cicinnati.

Marshall, S. J., Biddle, S. J., Gorely, T., Cameron, N., & Murdey, I. (2004). Relationships between media use, body fatness and physical activity in children and youth: a meta-analysis. *Int J Obes Relat Metab Disord, 28*(10), 1238-1246.

Martyn, D. (1999). *The good research guide: for small-scale social research projects.* Philadelphia: Open University Press.

Materson, B. J. (2003). What defines an adolescent as having hypertension? *J Hypertens, 21*(1), 13-14.

Matsushita, Y., Yoshiike, N., Kaneda, F., Yoshita, K., & Takimoto, H. (2004). Trends in childhood obesity in Japan over the last 25 year from the national nutrition survey. *Obes Res, 12*(2), 205-214.

Mautner, R. D., Owen, S. V., & Furnham, A. (2000). Cross-cultural explanations of body image disturbance in western cultural samples. *Int J Eat Disord, 28*(2), 165-172.

McCabe, M. P., & Ricciardelli, L. A. (2001). Parent, peer, and media influences on body image and strategies to both increase and decrease body size among adolescent boys and girls. *Adolescence, 36*(142), 225-240.

McCabe, M. P., & Ricciardelli, L. A. (2003). Body image and strategies to lose weight and increase muscle among boys and girls. *Health Psychol, 22*(1), 39-46.

McCabe, M. P., & Ricciardelli, L. A. (2004). Body image dissatisfaction among males across the lifespan: A review of past literature. *J Psychosom Res, 56*, 675-685.

McCabe, M. P., & Ricciardelli, L. A. (2005). A prospective study of pressures from parents, peers, and the media on extreme weight change behaviors among adolescent boys and girls. *Behav Res Ther, 43*(5), 653-668.

McCabe, M. P., Ricciardelli, L. A., & Finemore, J. (2002). The role of puberty, media and popularity with peers on strategies to increase weight, decrease weight and increase muscle tone among adolescent boys and girls. *J Psychosom Res, 52*, 145-153.

McCabe, M. P., & Vincent, M. A. (2003). The role of biodevelopmental and psychological factors in disordered eating among adolescent males and females. *European Eating Disorders Review, 11*(4), 315-328.

McConnell, K. E. (1998). *Body image as a motivation of physical activity in adolescent females.* Unpublished PhD, Arizona State University.

McGuire, M. T., Story, M., Neumark-Sztainer, D., Halcon, L., Campbell-Forrester, S., & Blum, R. W. (2002). Prevalence and correlates of weight-control behaviors among Caribbean adolescent students. *J Adolesc Health, 31*(2), 208-211.

Mikkelsson, L. O., Nupponen, H., Kaprio, J., Kautiainen, H., Mikkelsson, M., & Kujala, U. M. (2006). Adolescent flexibility, endurance strength, and physical activity as predictors of adult tension neck, low back pain, and knee injury: a 25 year follow up study. *Br J Sports Med, 40*(2), 107-113.

Mikkila, V., M., L.-K., Pietinen, P., Virtanen, S. M., ., & Rimpela, M. (2003). Associates of obesity and weight dissatisfaction among Finnish adolescents. *Public Health Nutr, 6*(1), 49-56.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis :an expanded sourcebook* (2nd ed. ed.). London: Sage.

Mo, Z. (476B.C.-390B.C.). *Jian Ai.*

Moore, D. C. (1993). Body image and eating behavior in adolescents. *J Am Coll Nutr, 12*(5), 505-510.

Murray, S. (1999). Eating disorders and criticism of cultural ideals. *European Eating Disorders Review, 7*, 204-212.

Must, A., Jacques, P. F., Dallal, G. E., Bajema, C. J., & Dietz, W. H. (1992). Long-term morbidity and mortality of overweight adolescents: A follow-up of the Harvard Growth Study of 1922 to 1935. *N Engl J Med, 327*(19), 1350-1355.

Must, A., & Strauss, R. S. (1999). Risks and consequences of childhood and adolescent obesity. *Int J Obes, 23*(Suppl: 2), S2-S11.

Mutrie, N., & Parfitt, G. (1998). Physical activity and its link with mental, social and moral health in young people. In S. Biddle & J. Sallis & N. Cavill (Eds.), *Young and active? young people and health : enhancing physical activity - evidence and implications* (pp. 49-68): London: Health Education Authority.

National Association of Social Workers. (2001). Adolescent girls and body image. *Adolescent Health, 2*, 4.

National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. (2004). The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents. *Pediatrics, 114 (supplement)*(2), 555-576.

Neff, L. J., Sargent, R. G., MCkeown, R. E., Jackson, K. L., & Valois, R. F. (1997). Black-White differences in body size perceptions and weight management practices among adolescent females. *J Adolesc Health, 20*(6), 459-465.

Neumark-Sztainer, D., & Hannan, P. J. (2000). Weight-related behaviors among adolescent girls and boys: results from a national survey. *Arch Pediatr Adolesc Med, 154*(6), 569-577.

Neumark-Sztainer, D., Paxton, S. J., Hannan, P. J., Haines, J., & Story, M. (2006). Does body satisfaction matter? Five-year longitudinal associations between body satisfaction and health behaviors in adolescent females and males. *J Adolesc Health, 39*(2), 244-251.

Neumark-Sztainer, D., Story, M., & French, S. A. (1996). Covariations of unhealthy weight loss behaviors and other high-risk behaviors among adolescents. *Arch Pediatr Adolesc Med, 150*(3), 304-308.

Neumark-Sztainer, D., Wall, M., Eisenberg, M. E., Story, M., & Hannan, P. J. (2006). Overweight status and weight control behaviors in adolescents: longitudinal and secular trends from 1999 to 2004. *Prev Med, 43*(1), 52-59.

Neumark-Sztainer, D., Wall, M., Guo, J., Story, M., Haines, J., & Eisenberg, M. (2006). Obesity, disordered eating, and eating disorders in a longitudinal study of adolescents: How do dieters fare 5 years later? *J Am Diet Assoc, 106*(4), 559-568.

Norris, R., Carroll, D., & Cochrane, R. (1992). The effects of physical activity and exercise training on psychological stress and well-being in an adolescent population. *J Psychosom Res, 36*(1), 55-65.

North American Association for The Study of Obesity. (2003). *Childhood obesity.* North American Association for The Study of Obesity. Available: www.naaso.org/information/childhood_overweight.asp [2005, 17 April].

Novotny, R., Daida, Y. G., Grove, J. S., Acharya, S., Vogt, T. M., & Paperny, D. (2004). Adolescent dairy consumption and physicl activity associated with bone mass. *Prev Med, 39*, 355-360.

Nowak, M. (1998). The weight-conscious adolescent: body image, food intake, and weight-related behavior. *J Adolesc Health, 6*, 389-398.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). London: McGraw-Hill.

O'dea, J. A. (2004). Evidence for a self-esteem approach in the prevention of body image and eating problems among children and adolescents. *Eating Disorders, 12*, 225-239.

O'dea, J. A. (2005). Prevention o fchild obesity: 'First, do no harm'. *Health Educ Res, 20*(2), 259-265.

Offer, D., Ostrov, E., Howard, K. I., & Atkinson, R. (1988). *The Teenage world: adolescents' self-image in ten countries.* New York: Plenum Publishing Corporation.

Olmsted, M. P., & McFarlane, T. (2004). Body weight and body image. *BMC Womens Health, 4*(Suppl 1), S5.

Ozdirenc, M., Ozcan, A., Akin, F., & Gelecek, N. (2005). Physical fitness in rural children compared with urban children in Turkey. *Pediatr Int, 47*(1), 26-31.

Page, A., & Fox, K. R. (1997). Adolescent weight management and the physical self. In K. R. Fox (Ed.), *The physical self: from motivation to well-being* (pp. 229-256). Champaign: Human Kinetics.

Page, R. M., Lee, C. M., & Miao, N. F. (2005). Self-perception of body weight among high school students in Taipei, Taiwan. *Int J Adolesc Med Health, 17*(2), 123-136.

Pall, D., Katona, E., Fulesdi, B., Zrinyi, M., Zatik, J., Bereczki, D., Polgar, P., & Kakuk, G. (2003). Blood pressure distribution in a Hungarian adolescent population: comparison with normal values in the USA. *J Hypertens, 21*(1), 41-47.

Pan, C. (25A.D.-220A.D.). *The ladies book of admonitions.*

Parr, J. M., Kavanagh, D. J., Young, R. M., & McCafferty, K. (2006). Views of general practitioners and benzodiazepine users on benzodiazepines: a qualitative analysis. *Soc Sci Med, 62*(5), 1237-1249.

Pate, R. R., Heath, G. W., Dowda, M., & Trost, S. G. (1996). Associations between physical activity and other health behaviors in a representative sample of US adolescents. *Am J Public Health, 86*(11), 1577-1581.

Pate, R. R., Trost, S. G., Levin, S., & Dowda, M. (2000). Sports participation and health-related behaviors among US youth. *Arch Pediatr Adolesc Med, 154*, 904-911.

Patel, K. A., & Gray, J. J. (2001). Judgement accuracy in body preferences among African Americans *Sex Roles, 44*(3/4), 227-235.

Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). California: Sage.

Pesa, J. A., Syre, T. R., & Jones, E. (2000). Psychosocial differences associated with body weight among female adolescents: the importance of body image. *J Adolesc Health, 26*(2), 330-337.

Peterson, B. B. (Ed.). (2000). *Notable women of China: Shang dynasty of the early twentieth century.* New York: M.E. Sharpe.

Pongprapai, S., Mo-suwan, L., & Leelasamran, W. (1994). Physical fitness of obese school children in Hat Yai, southern Thailand. *Southeast Asian J Trop Med Public Health, 25*(2), 354-360.

Presnell, K., Bearman, S. K., & Stice, E. (2004). Risk factors for body dissatisfaction in adolescent boys and girls: A prospective study. *Int J Eat Disord, 36*, 389-401.

Pronk, N. P., & Wing, R. R. (1994). Physical activity and long-term maintenance of weight loss. *Obes Res, 2*, 587-599.

Raitakari, O. T., Taimela, S., Porkka, K. V. K., Telama, R., Valimaki, I., Akerblom, H., & Viikari, J. S. A. (1997). Associations between physical activity and risk factors for coronary heart disease: The Cardiovascular Risk in Young Finns Study. *Med Sci Sports Exerc, 29*(8), 1055-1061.

Regan, F., & Betts, P. (2006). A brief review of the health consequences of childhood obesity. In N. Cameron & N. G. Norgan & G. T. H. Ellison (Eds.), *Childhood obesity: contemporary issues* (pp. 39-49). London: Taylor & Francis.

Reich, A., Müller, G., Gelbrich, G., Deutscher, K., Gödicke, R., & Kiess, W. (2003). Obesity and blood pressure: results from the examination of 2365 schoolchildren in Germany. *Int J Obes, 27*(12), 1459-1464.

Rhea, D. (2004). *Body image perceptions of female adolescent volleyball players.* American Volleyball Coaches Association. Available: http://www.avca.org/ [2004, 22 August].

Rhodes, R. H., Hill, C. E., Thompson, B. J., & Elliott, R. (1994). Client retrospective recall of resolved and unresolved misunderstanding events. *Journal of Counseling Psychology, 41*(4), 473-483.

Ricciardelli, L. A., & McCabe, M. P. (2001a). Children's body image concerns and eating disturbance: A review of the literature. *Clin Psychol Rev, 21*(3), 325-344.

Ricciardelli, L. A., & McCabe, M. P. (2001b). Self-esteem and negative affect as moderators of sociocultural influences on body dissatisfaction, strategies to decrease weight, and strategies to increase muscles among adolescent boys and girls *Sex Roles, 44*(3/4), 189-207.

Ricciardelli, L. A., McCabe, M. P., & Banfield, S. (2000). Body image and body change methods in adolescent boys – roles of parents, friends, and the media. *J Psychosom Res, 49*, 189-197.

Ricciardelli, L. A., McCabe, M. P., Holt, K. E., & Finemore, J. (2003). A biopsychosocial model for understanding body image and body change strategies among children. *Applied Developmental Psychology, 24*, 475-495.

Rice, C. (1995). *Promoting healthy body image: A guide for program planners.* Canada Ontario: Ontario's Newborn and Early Child Department Resource Centre.

Rice, F. P. (1996). *The adolescent : development, relationships, and culture* (8th ed.): London: Allyn and Bacon.

Riddoch, C. (1998). Relationships between physical activity and physical health in young people. In S. Biddle & J. Sallis & N. Cavill (Eds.), *Young and active? young people and health : enhancing physical activity - evidence and implications* (pp. 17-48): London: Health Education Authority.

Rieger, E., Touyz, S. W., Swain, T., & Beumont, P. J. V. (2001). Cross-cultural research on anorexia nervosa: Assumptions regarding the role of body weight. *Int J Eat Disord, 29*(2), 205-215.

Rinderknecht, K., & Smith, C. (2002). Body image perceptions among urban Native American youth. *Obes Res, 10*(5), 315-327.

Robbins, L. B., Pender, N. J., & Kazanis, A. S. (2003). Barriers to physical activity perceived by adolescent girls. *J Midwifery Womens Health, 48*(3), 206-212.

Rodriguez, D., & Audrain-McGovern, J. (2005). Physical activity, global physical self-concept, and adolescent smoking. *Ann Behav Med, 30*(3), 251-259.

Rosenberg, M. (1965). *Society and the adolescent self-image.* Princeton, NJ: Princeton University Press.

Rosenblum, G. D., & Lewis, M. (1999). The relations among body image, physical attractiveness, and body mass in adolescence. *Child Dev, 70*(1), 50-64.

Rubens (Artist). (17th Century). *The Three Graces* [Painting].

Rubinstein, S., & Caballero, B. (2000). Is Miss America an undernourished role model? *JAMA, 283*(12), 1569.

Ruggiero, G. M., Levi, D., Ciuna, A., & Sassaroli, S. (2003). Stress situation reveals an association between perfectionism and drive for thinness *Int J Eat Disord, 34*(2), 220-226.

Rukavina, T., & Pokrajac-Bulian, A. (2006). Thin-ideal internalization, body dissatisfaction and symptoms of eating disorders in Croatian adolescent girls. *Eat Weight Disord, 11*(1), 31-37.

Salbe, A. D., Weyer, C., Harper, I., Lindsay, R. S., Ravussin, E., & Tataranni, P. A. (2002). Assessing the risk factors for obesity between childhood and adolescents. II. Energy metabolism and physical activity. *Pediatrics, 110*, 307-314.

Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. *Med Sci Sports Exerc, 32*(5), 963-975.

Sands, E. R., & Wardle, J. (2003). Internalization of ideal body shapes in 9-12-year-old girls. *Int J Eat Disord, 33*(2), 193-204.

Sands, R., Tricker, J., Sherman, C., Armatas, C., & Maschette, W. (1997). Disordered eating patterns, body image, self-esteem, and physical activity in preadolescent school children. *Int J Eat Disord, 21*(2), 159-166.

Sarlio-Lahteenkorva, S., Parna, K., Palosuo, H., Zhuravleva, I., & Mussalo-Rauhamaa, H. (2003). Weight satisfaction and self-esteem among teenagers in Helsinki, Moscow and Tallinn. *Eat Weight Disord, 8*(4), 289-295.

Sasakawa Sports Foundation. (2002). *Adolescent sports life data 2002*: Japan Sasakawa Sports Foundation.

Savva, S. C., Kourides, Y., Tornaritis, M., Epiphaniou-Savva, M., Chadjigeorgiou, C., & Kafatos, A. (2002). Obesity in children and adolescents in Cyprus, prevalence and predisposing factors. *Int J Obes, 26*, 1036-1045.

Schilder, P. (1950). *The image and appearance of the human body*. New York: International University Press.

Schmidt, G. J., Walkuski, J. J., & Stensel, D. J. (1998). The Singapore youth coronary risk and physical activity study. *Med Sci Sports Exerc, 30*(1), 105-113.

Schmitz, K. H., Jacobs, J. D. R., Hong, C. P., Steinberger, J., Moran, A., & Sinaiko, A. R. (2002). Association of physical activity with insulin sensitivity in children. *Int J Obes, 26*(10), 1310-1316.

Schwartz, D. J., Phares, V., Tantleff-Dunn, S., & Thompson, J. K. (1999). Body image, psychological functioning, and parental feedback regarding physical appearance. *Int J Eat Disord, 25*, 339-343.

Schwartz, M. B., & Puhl, R. (2003). Childhood obesity: a social problem to solve. *Obes Rev, 4*(1), 57-72.

Serdula, M. K., Ivery, D., Coates, R. J., Freedman, D. S., Williamson, D. F., & Byers, T. (1993). Do obese children become obese adults? a review of the literature. *Prev Med, 22*(2), 167-177.

Shadley, G. (2002). *Reflections in their mirrors: How adolescent girls experience their bodies.* Unpublished Master, Concordia University, Canada.

Shen, Y.-J. (1984). Selected paintings of beauties through the Ages. In K.-S. Ho (Ed.), *Selected paintings of beauties through the Ages* (pp. 6-8). Taipei: ART Book Co., LTD.

Shih, M. Y., & Kubo, C. (2002). Body shape preference and body satisfaction in Taiwanese college students. *Psychiatry Res, 111*(2-3), 215-228.

Shisslak, C. M., Mays, M. Z., Crago, M., Jirsak, J. K., Taitano, K., & Cagno, C. (2006). Eating and weight control behaviors among middle school girls in relationship to body weight and ethnicity. *J Adolesc Health, 38*(5), 631-633.

Siao, S. (2004). Western and Eastern cultures contribute to female beauty in 2004, *Shanghai Financial News*. Shanghai.

Siao, Y. T. (2004). *Four beautiful women*. Available: http://www.2000y.net/100933/index.asp?xAction=xReadNews&NewsID=157 [2004, 13 August].

Sibley, B. A., & Etnier, J. L. (2003). The relationship between physical activity and cognition in children: a meta-analysis. *Pediatr Exerc Sci, 15*, 243-256.

Siegel, J., M., Yancey, A. K., Aneshensel, C. S., & Schuler, R. (1999). Body image, perceived pubertal timing, and adolescent mental health. *J Adolesc Health, 25*(2), 155-165.

Slack, T., Hsu, Y., Tsai, C., & Hong, F. (2002). The road to modernisation: sport in Taiwan. *Int J Hist Sport, 19*, 343-365.

Smith, D. E., Thompson, J. K., Raczynski, J. M., & Hilner, J. E. (1999). Body image among men and women in a biracial cohort: The CARDIA Study. *Int J Eat Disord, 25*, 71-82.

Smolak, L. (2002). Body image development in children. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: a handbook of theory, research, and clinical practice* (pp. 65-73). New York: The Guilford Press.

Smolak, L. (2004). Body image in children and adolescents: where do we go from here? *Body image, 1*(1), 15-28.

Smolak, L., & Levine, M. P. (2002). Body image in children. In J. K. Thompson & L. Smolak (Eds.), *Body image, eating disorders, and obesity in youth: assessment, prevention, and treatment* (pp. 41-66). Washington: American Psychological Association.

Smolak, L., Levine, M. P., & Thompson, J. K. (2001). The use of the Sociocultural Attitudes Towards Appearance Questionnaire with middle school boys and girls. *Int J Eat Disord, 29*(2), 216-223.

Spence, J., & Chin, A. (1996). *The Chinese century: a photographic history*. London: Harper Collins Publishers.

Stager, M., Harvey, R., Secic, M., Camlin-Shingler, K., & Cromer, B. a. (2006). Self-reported physical activity and bone mineral density in urban adolescent girls. *J Pediatr Adolesc Gynecol, 19*(1), 17-22.

Stager, M., Havvey, R., Sylvia, S., Secic, M., & Cromer, B. (2004). Self-reported physical activity and bone mineral density in urban adolescent girls (abstract). *J Pediatr Adolesc Gynecol, 17*(3), 221-229.

Steckler, A., Mcleroy, K. R., Goodman, R. M., Bird, S. T., & McCormick, L. (1992). Toward integrating qualtative and quantitative methods: an introduction. *Health Educ Q, 19*(1), 1-8.

Stein, K. F., & Hedger, K. M. (1997). Body weight and shape self-cognitions, emotional distress, and disordered eating in middle adolescent girls. *Arch Psychiatr Nurs, 11*(5), 264-275.

Stice, E., & Bearman, S. K. (2001). Body-image and eating disturbances prospectively predict increases in depressive symptoms in adolescent girls: A growth curve analysis. *Dev Psychol, 37*(5), 597-607.

Stice, E., & Shaw, H. (2003). Prospective relations of body image, eating, and affective disturbances to smoking onset in adolescent girls: How Virginia slims. *J Consult Clin Psychol, 71*(1), 129-135.

Stice, E., & Whitenton, K. (2002). Risk factors for body dissatisfaction in adolescent girls: A longitudinal investigation. *Dev Psychol, 38*(5), 669-678.

Stone, E. J., McKenzie, T. H., Welk, G. J., & Booth, M. L. (1998). Effects of physical activity intervention in youth. *Am J Prev Med, 15*(4), 298-315.

Strauss, R. S., & Pollack, H. A. (2003). Social marginalization of overweight children. *Arch Pediatr Adolesc Med, 15*(8), 746 - 752.

Striegel-Moore, R. H., & Franko, D. L. (2002). Body image Issues among girls and women. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: a handbook of*

theory, research, and clinical practice (pp. 183-191). New York: The Guilford Press.

Sundgot-Borgen, J. (1994). Risk and trigger factors for the development of eating disorders in female elite athletes. *Med Sci Sports Exerc, 26*(4), 414-419.

Syu, N. (Artist). (618A.D-907AD). *Han Gong Cyu* [poem].

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. London: Allyn & Bacon.

Taiwan Department of Health. (2004, 27/Jan/2006). *Hypertension in Taiwan.* Available: http://www.doh.gov.tw/statistic/data/性別統計指標/性別統計指標/性別統計指.htm [2006, 27/Jan/2006].

Taiwan Executive Yuan. (2004). *2004 Social Indicators*: Taiwan Directorate-General of Budget, Accounting and Statistics, Executive Yuan.

Taiwan National Council on Physical Fitness and Sports. (1999). *National physical fitness survey*. Taiwan: National Council on Physical Fitness and Sports.

Taiwan National Council on Physical Fitness and Sports. (2001). *National physical fitness survey*. Taiwan: National Council on Physical Fitness and Sports.

Taiwan National Council on Physical Fitness and Sports. (2004). *National Physical Activity Survey*. Taipei: Taiwan National Council on Physical Fitness and Sports.

Taiwan National Institute for the Health Research. (2001). *Physical activity and children and adolescent obesity*. Taipei: Taiwan National Institute for the Health Research.

Taiwan National Palace Museum. (2003). *Blossoming through the ages: women in Chinese art and culture from the museum collection*. Taiwan National Palace Museum. Available: http://www.npm.gov.tw/exh92/beauty0328/chinese/01.htm [2004, 12 August].

Taiwan Overseas Chinese Affairs Commission. (2004). *The world of Chinese culture. Taiwan Overseas Chinese Affairs Commission: Global Chinese Language Culture Center*. Available: http://edu.ocac.gov.tw/culture/chinese/CULTUREENGLISH/Language/Ewhole03_02.htm [2004, 12 August].

Tang, Y. (Artist). (1470-1523). *Lady with Fan* [Painting].

Tantleff-Dunn, S., & Gokee, J. L. (2002). Interpersonal influences on body image development. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: a handbook of theory, research, and clinical practice* (pp. 108-116). New York: The Guilford Press.

Tashakkori, A., & Teddlie, C. B. (1998). *Mixed methodology : combining qualitative and quantitative approaches*. California: Sage.

Tashakkori, A., & Teddlie, C. B. (Eds.). (2003). *Handbook of mixed methods in social & behavioral research*. California: Sage.

Teddlie, C., & Tashakkori, A. (2003). Major issues and controversies in the use of mixed mehtods in the social and behavioral sciences. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in socail and behavioral research* (pp. 3-50). California: Sage.

Tee, E. (2002). Obesity in Asia: prevalence and issues in assessment methodologies. *Asia Pacific J Clin Nutr, 11*(3), S694-S701.

Ter Bogt, T. F. M., Van Dorsselaer, S. A. F. M., Monshouwer, K., Verdurmen, J. E. E., Engels, R. C. M. E., & Vollebergh, W. A. M. (2006). Body mass index and

body weight perception as risk factors for internalizing and externalizing problem behavior among adolescents *J Adolesc Health, 39*(1), 27-34.

The Association for the Study of Obesity. (2004). *Fact sheets: Childhood obesity* Available: http://www.aso.org.uk [2005, 18 April].

The McCreary Centre Society. (2003). *Adolescent Health Survey 2003*. Vancouver: The McCreary Centre Society.

Thomas, N. E., Baker, J. S., & Davies, B. (2003). Established and recently identified coronary heart disease risk factors in young people. *Sports Med,* 33(9), 633-650.

Thompson, A. M., Humbert, M. L., & Mirward, R. L. (2003). A longitudinal study of the impact of childhood and adolescent physical activity experiences on adult physical activity perception and behaviors. *Qual Health Res, 13*(3), 358-377.

Thompson, J. K. (1990). *Body image disturbance: assessment and Treatment*. New York: Pergamon Press.

Thompson, J. K. (1996). Assessing body image disturbance: Measures, methodology, and implementation. In J. K. Thompson (Ed.), *Body image, eating disorders, and obesity* (pp. 49-81). Washington, DC: American Psychological Association.

Thompson, J. K. (2004). The (mis)measurement of body image: ten strategies to improve assessment for applied and research purposes. *Body image, 1*(1), 7-14.

Thompson, J. K., Coovert, M. D., Richards, K. J., Johnson, S., & Cattarin, J. (1995). Development of body image, eating disturbance, and general psychological functioning in female adolescents: covariance structure modeling and longitudinal investigations. *Int J Eat Disord, 18*(3), 221-236.

Thompson, J. K., & Gray, J. J. (1995). Development and validation of a new body image assessment scale. *J Pers Assess, 64*(2), 258-269.

Thompson, J. K., Heinberg, L. J., Altabe, M., & Tantleff-Dunn, S. (1998). *Exacting beauty: theory, assessment, and treatment of body image disturbance* Washington: American Psychological Association.

Thompson, J. K., & Smolak, L. (Eds.). (2002). *Body image, eating disorders, and obesity in youth: assessment, prevention, and treatment*. Washington: American Psychological Association.

Thompson, J. K., & Stice, E. (2001). Thin-ideal internalization: Mounting evidence for a new risk factor for body-image disturbance and eating pathology. *Current Directions in Psychological Science, 10*(5), 181-183.

Tiggemann, M. (2002). Media influences on body image development. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: a handbook of theory, research, and clinical practice* (pp. 91-98). New York: The Guilford Press.

Tiggemann, M. (2005). Body dissatisfaction and adolescent self-esteem: Prospective findings *Body image, 2*(2), 129-135.

Tiggemann, M., Gardiner, M., & Slater, A. (2000). "I would rather be size 10 than have straight A's": a focus group study of adolescent girls' wish to be thinner. *J Adolesc, 23*(6), 645-659.

Tiggemann, M., & Williamson, S. (2000). The effect of exercise on body satisfaction and self-esteem as a function of gender and age. *Sex Roles, 43*(1/2), 119-127.

Tolfrey, K., Jones, A. M., & Campbell, I. G. (2000). The effect of aerobic exercise training on the lipid-lipoprotein profile of children and adolescents. *Sports Med, 29*(2), 99-112.

Tortolero, S. R., Taylor, W. C., & Murray, N. G. (2000). Physical activity, physical fitness and social, psychological and emotional health. In N. Armstrong & W. V. Mechelen (Eds.), *Paediatric exercise science and medicine* (pp. 273-293). New York: Oxford University Press.

Troiano, R. P., & Flegal, K. M. (1998). Overweight children and adolescents: Description, epidemiology, and demographics. *Pediatrics, 101*, 497-503.

Trost, S. G., Levin, S., & Pate, R. R. (2000). Sport, physical activity and other health behaviours in children and adolescents. In N. Armstrong & W. V. Mechelen (Eds.), *Paediatric exercise science and medicine* (pp. 295-304). New York: Oxford University Press.

Tsai, S. H. (2001). *Body image and exercise behavior toward the exercise and weight management class students of National Taiwan University*. Taipei: Han Wen.

Twiggy (Artist). (1960's). *Twiggy* [Photo].

Twisk, J. W. R., Mechelen, W. V., Kemper, H. C. G., & Post, G. B. (1997). The relation between "Long-Term Exposure" to lifestyle during youth and young adulthood and risk factors for cardiovascular disease at adult age. *J Adolesc Health, 20*(4), 309-319.

UK Department of Health. (2002). *Drug use, smoking and drinking among young people in England in 2001*. London: The Stationery Office.

UK Department of Health. (2003). *Health Survey for England 2002*. London: The Stationery Office.

UK Department of Health. (2004). *At least five a week: A report from the Chief Medical Officer*. London: Department of Health.

UK House of Commons. (2004). *Obesity: Third report of session 2003-04*. London: The Stationery Office.

Usmini, S., & Daniluk, J. (1997). Mothers and their adolescent daughters: relationship between self-esteem, gender role identity, and body image. *Journal of Youth and Adolescence, 26*(1), 45-62.

Vanhala, M., P., V., Kumpusalo, E., Halonen, P., & Takala, J. (1998). Relation between obesity from childhood to adulthood and the metabolic syndrome: population based study. *BMJ, 317*(7154), 319.

Vohs, K. D., Bardone, A. M., Joiner, T. E., Jr, A., L. Y., & Heatherton, T. F. (1999). Perfectionism, perceived weight status, and self-esteem interact to predict bulimic symptoms: a model of bulimic symptom development. *J Abnorm Psychol, 108*(4), 695-700.

Vohs, K. D., Voelz, Z. R., Pettit, J. W., Bardone, A. M., Katz, J., Abramson, L. Y., Heatherton, T. F., & Joiner, T. E. (2001). Perfectionism, body dissatisfaction, and self-esteem: An interactive model of bulimic symptom development. *J soc clin psychol, 20*(4), 476-497.

Wabitsch, M. (2000a). Overweight and obesity in European children and adolescents: causes and consequences, treatment and prevention. An introduction. *Eur J Pediatr, 159*(Suppl: 1), S5-S7.

Wabitsch, M. (2000b). Overweight and obesity in European children: definition and diagnostic procedures, risk factors and consequences for later health outcome. *Eur J Pediatr, 159*(Suppl: 1), S8-S13.

Wang, C. C., & Ghou, C. G. (2003). *Logistic regression models: methods and application*. Taiwan Taipei: Wu-Nan.

Wang, C. H. (2001). *Influence of personality and network interaction on the network addiction.* Unpublished Master, Fu Jen Catholic University, Taipei.

Wang, Y. (2001). Cross-national comparison of childhood obesity: the epidemic and the relationship between obesity and socio-economic status. *Int J Epidemiol, 30*, 1129-1136.

Wang, Y., Monteiro, C., & Popkin, B. M. (2002). Trends of obesity and underweight in older children and adolescents in the United States, Brazil, China and Russiz. *Am J Clin Nutr, 75*, 471-474.

Wang, Y., & Wang, J. Q. (2002). A comparison of international references for assessment of child and adolescent overweight and obesity in different populations. *Eur J Clin Nutr, 56*, 973-982.

Wardle, J., Bindra, R., Fairclough, B., & West combe, A. (1993). Culture and body image: body perception and weight concern in young Asian and Caucasian British women. *Journal of Community and Applied Social Psychology, 3*, 173-181.

Wedderkopp, N., Froberg, K., Hansen, H. S., Riddoch, C., & Andersen, L. B. (2003). Cardiovascular risk factors cluster in children and adolescents with low physical fitness: The European Youth Heart Study. *Pediatr Exerc Sci, 15*(4), abstract.

Wedderkopp, N., Leboeuf-Yde, C., Andersen, L. B., Froberg, K., & Hansen, H. S. (2003). Back pain in children: no association with objectively measured level of physical activity. *Spine, 28*(17), 2019-2024.

Wertheim, E. H., Koerner, J., & Paxton, S. J. (2001). Longitudinal predictors of restrictive eating and bulimic tendencies in three different age groups of adolescent girls *Journal of Youth and Adolescence, 30*(1), 69-81.

Wertheim, E. H., Paxton, S. J., Schutz, H. K., & Muir, S. L. (1997). Why do adolescent girls watch their weight? An interview study examining sociocultural pressures to be thin. *J Psychosom Res, 42*(4), 345-355.

Wertheim, E. H., Paxton, S. J., & Tilgner, L. (2004). Test–retest reliability and construct validity of Contour Drawing Rating Scale scores in a sample of early adolescent girls. *Body image, 1*(2), 199-205.

Westergaard, J., Noble, I., & Walker, A. (1989). *After redundancy: The experience of economic insecurity.* Cambridge: Polity Press.

Whitaker, R. C., Wright, J. A., Pepe, M. S., Seidel, K. D., & Dietz, W. H. (1997). Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med, 337*(13), 869-873.

Wildes, J. E., Emery, R. E., & Simons, A. D. (2001). The role of ethnicity and culture in the development of eating disturbance and body dissatisfaction: A meta-analytic review. *Clin Psychol Rev, 21*(4), 521-551.

Williams, L. K., Ricciardelli, L. A., McCabe, M. P., Waqa, G. G., & Bavadra, K. (2006). Body image attitudes and concerns among indigenous Fijian and European Australian adolescent girls. *Body Image, 3*(3), 275-287.

Williams, P. A., & Cash, T. F. (2001). Effects of a circuit weight training program on the body images of college students. *Int J Eat Disord, 30*, 75-82.

Wing, R. R., & Jakicic, J., M. (2000). Changing lifestyle: Moving from sedentary to active. In C. Bouchard (Ed.), *Physical activity and obesity* (pp. 372-389). Champaign: Human Kinetics Publishers.

Wong, J., Ho, S. Y., & Lam, T. H. (2004). *Central and Western Distric Adolescent Health Survey: Report of the cross-sectional survey*. Department of Community Medicine: University of Hong Kong.

Wong, Y., Bennink, M. R., Wang, M., & Yamamoto, S. (2000). Overconcern about thinness in 10- to 14-year-old schoolgirls in Taiwan. *J Am Diet Assoc, 100*(2), 234-236.

Wong, Y., & Huang, Y. C. (1999). Obesity concerns, weight satisfaction and characteristics of female dieters: a study on female Taiwanese college students. *J Am Coll Nutr, 18*(2), 194-200.

World Health Organisation. (2000). *Obesity: preventing and managing the global epidemic- Report of a WHO Consultation*: World Health Organisation (WHO Technical Report Series, No. 894).

World Health Organisation. (2003). *Health and development through physical activity and sport*: World Health Organisation.

World Health Organisation. (2004a). *Global strategy on diet, physical activity and health*: World Health Organisation.

World Health Organisation. (2004b). *Move for Health Day 2004 - "Active Youth"*. World Health Organisation. Available: http://www.who.int/hpr/physactiv/move.for.health.shtml [2004, 22 August].

World Health Organization. (2003a). 2003 World Health Organization (WHO) / International Society of Hypertension (ISH) statement on management of hypertension. *J Hypertens, 21*, 1983-1992.

World Health Organization. (2003b). *Diet, nutrition and the prevention of chronic diseases*: World Health Organization.

Wu, L. N., & Huang, S. J. (1999). Body image and exercise behavior of vocational school students in Taipei. *School Health (Taipei), 35*, 1-31.

Wu, S. Y., Pender, N., & Noureddine, S. (2003). Gender differences in the psychosocial and cognitive correlates of physical activity among Taiwanese adolescents: a structural equation modeling approach. *Int J Behav Med, 10*(2), 93-105.

Wu, T. Y., & Pender, N. (2002). Determinants of physical activity among Taiwanese adolescents: An application of the health promotion model. *Res Nurs Health, 25*(1), 25-36.

Xu, K. (2000). Xi Shi. In B. B. Peterson (Ed.), *Notable women of China: Shang dynasty of the early twentieth century* (pp. 25-27). New York: M.E. Sharpe.

Yang, C.-F. J., Gray, P., & Pope, H. G. (2005). Male body image in Taiwan versus the West: Yanggang zhiqi meets the adonis complex. *Am J Psychiatry, 162*(2), 263-269.

Yeh, C. J., Arora, A. K., Inose, M., Okubo, Y., Li, R. H., & Greene, P. (2003). The cultural adjustment and mental health of Japanese immigrant youth. *Adolescence, Fall 38*(151), 481-500.

Yoshiike, N., Kaneda, F., & Takimoto, H. (2002). Epidemiology of obesity and public health strategies for its control in Japan. *Asia Pacific Journal of Clinical Nutrition, 11*(S8), S727-731.

Young-Hyman, D., Schlundt, D. G., Herman-Wenderoth, L., & Bozylinski, K. (2003). Obesity, appearance, and psychosocial adaptation in young African American children. *J Pediatr Psychol, 28*(7), 463-472.

Yu, C., Liaw, Y., & Barnd, S. M. (2004). Cultural and social factors affecting women's physical activity participation in Taiwan. *Sport, Education and Society, 9*(3), 379-393.

Yu, Y. Y. (1999). Discussion on obesity. *School Health (Taiwan), 35*, 85-99.

Zabinski, M. F., Calfas, K. J., Gehrman, C. A., Wilfley, D. E., & Sallis, J. F. (2001). Effects of a physical activity intervention on body image in university seniors: project GRAD. *Ann Behav Med, 23*(4), 247-252.

Zabinski, M. F., Saelens, B. E., Stein, R. I., Hayden-Wade, H. A., & Wilfley, D. E. (2003). Overweight children's barriers to and support for physical activity. *Obes Res, 11*(2), 238-246.

Zhao, X., & Hu, Y. (2000). Zhao FeiYan. In B. B. Peterson (Ed.), *Notable women of China: Shang dynasty of the early twentieth century* (pp. 87-89). New York: M.E. Sharpe.

University of BRISTOL

Appendix 1: Ethical approval

Li-Jung Chen

20 November 2005

Dear Li-Jung

Re: Body image in Taiwanese adolescents: Influences on obesity and physical activity
Application: 05/045

The above study underwent ethical review by the Department of Exercise and Health Sciences ethics committee at their meeting on 20 September 2005. The terms of this committee are to confirm that ethical procedures in line with the University of Bristol and UBHT practice have been addressed by the applicant, that appropriate documentation has been prepared for securing participant consent and that the applicant has an action plan to consider data protection issues. We are happy that this study fulfils these requirements and that you have addressed all previous issues raised by the committee. In light of the satisfactory changes to the application, the departmental ethics committee gives approval for this application. Please contact the Ethics Chair, Dr Anne Haase, if you have any questions.

Best wishes and good luck with your research.

Anne M Haase, PhD
Department Ethics Chair
Lecturer in Exercise Nutrition and Health

Appendix 2: Published paper

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ORIGINAL ARTICLE

Obesity, fitness and health in Taiwanese children and adolescents

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Objective: To examine the prevalence of childhood and adolescent obesity in Taiwan and investigate the association between excess weight and physical fitness and blood pressure.
Design: Cross-sectional study.
Subjects: A total of 13 935 children and adolescents aged 6–18 years (boys: 7031, girls: 6904) were involved in the 1999 survey and 24 586 (boys: 12 367, girls: 12 219) were available in the 2001 survey.
Measurements: Weight, height, systolic and diastolic blood pressures, and health-related fitness tests (bent-leg curl-ups, sit-and-reach test and step test) were measured.
Results: The overall prevalence of obesity (including overweight) in boys was 19.8% in 1999 and 26.8% in 2001. It was lower in girls with 15.2% in 1999 and 16.5% in 2001. The normal weight group performed better ($P<0.05$) than the overweight/obese group in all fitness tests except in the 2001 sit-and-reach test where there were no differences between the two groups. The risk of hypertension increased nearly two times for the overweight/obese-fit group and nearly three times for the overweight/obese-unfit group compared to the normal weight-fit group (adjusted odds ratio (AOR) = 1.93, 95%CI = 1.514–2.451 and AOR = 2.93, 95%CI = 2.493–3.454, respectively).
Conclusion: Overall, the findings demonstrated that there is an increasing trend in overweight/obesity prevalence for Taiwanese youth even in a 2-year period. The overweight/obese youngsters tend to have poorer muscular strength and cardiovascular endurance than the normal weight group. The overweight/obese and unfit group had a greater risk of hypertension than other groups. However, this risk was significantly lower if obese/overweight children had a higher than average level of cardiovascular fitness.
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Keywords: obesity; fitness; hypertension; health; children and adolescents; Taiwan

Introduction

The World Health Organization (2000) has reported that obesity represents a growing threat to the health of populations in both developing and developed countries, affecting children and adults alike. The prevalence of childhood obesity is rising rapidly and has already raised concern in Europe, North and South America, and more recently in the Pacific Rim countries (Department of Health and Human Service, 2001; International Obesity Task Force, 2002; UK Department of Health, 2003; Lobstein *et al.*, 2004).

During early years, obesity is associated with risk factors for ill health and adverse physical and psychosocial consequences (Wabitsch, 2000a, b; Loke, 2002). For example, obese children and adolescents have higher systolic blood pressure and less healthy lipid profiles, as well as increased stress on weight bearing joints (Dietz, 1998; Chu, 2001; Loke, 2002). In addition, obese children are more likely to suffer from psychological problems such as poor self-image and low self-esteem (Dietz, 1998; Edmunds *et al.*, 2001). The long-term effects of obesity are that obese children are more likely to become obese adults (Serdula *et al.*, 1993), and are at increased risk of metabolic syndrome and other disorders accompanying obesity

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(Vanhala *et al.*, 1998; Must and Strauss, 1999). Hence, it is vital to understand and monitor obesity prevalence and its changes in order to combat the continuing rise of obesity among youth and adults.

Data on the prevalence and correlates of childhood obesity are available in many countries, especially in Europe and North America (Livingstone, 2000; Lobstein and Frelut, 2003; North American Association for The Study of Obesity, 2003; Lobstein *et al.*, 2004). Obesity in Asian countries has only recently received substantial attention. In Korea, the first standardized epidemiological survey regarding obesity prevalence was not conducted until 1995 (Kim *et al.*, 2005). However, several other Asian countries such as Japan have reported increases in childhood obesity (Lobstein *et al.*, 2004; Matsushita *et al.*, 2004).

Although we have identified 243 published studies in the last decade investigating obesity issues with Taiwanese populations (Taiwan National Central Library), only 11 of these studies focused on obesity prevalence and patterns in children and adolescents (Chen *et al.*, 1993; Lee *et al.*, 1994; Lee, 1995; Lee and Lee, 1997; Lin *et al.*, 1998; Yu, 1999; Huang and Wu, 2000; Chu, 2001, 2004; Huang *et al.*, 2003; Fu *et al.*, 2004). Seven of these studies were published in the Chinese language, and none of them used a nationally representative sample. Furthermore, the prevalence figures for obesity in children in Taiwan are still unclear as several definitions of obesity have been used (Lee, 1995; Yu, 1999; Taiwan National Institute for the Health Research, 2001). For example, two studies have reported data from large samples of schoolchildren but have focused on weight for height data (Huang and Wu, 2000; Huang *et al.*, 2003). Other studies have used 85th and 95th body mass index (BMI) percentiles for age or weight greater than 120% ideal body weight (Lee *et al.*, 1994; Lee, 1995; Lin *et al.*, 1998). Two recent papers reviewed the literature for childhood obesity in Taiwan (Chu, 2005; Hsieh and FitzGerald, 2005). One focused on the factors associated with childhood obesity and prevention strategies (Hsieh and FitzGerald, 2005). The other addressed the prevalence and trend of obesity in Taiwan from 1980 to 1996 where obesity was defined as >120% of mean body weight (Chu, 2005). As far as we are aware, there are no studies featuring recent nationally representative samples of children and adolescents that have used the now widely accepted and internationally founded BMI criteria developed for the International Obesity Task Force by Cole *et al.* (2000). The main advantages of these criteria are that they are derived from adult values associated with health risk and also allow international comparisons.

Little is known about the relationship between different elements of physical fitness and overweight or obesity in Taiwanese children and adolescents. For example, we do not know if lack of hip flexion flexibility, muscular endurance of the abdominal muscles or aerobic fitness, which are associated with poor physical function and health in adults, are related to degree of overweight in this population. Similarly, there are few data on the interaction between cardiovascular fitness and related indicators of ill health such as higher than normal blood pressure in children who are obese. Obesity when carried into adulthood is associated with increased risk of developing cardiovascular disease and other health problems (Dietz, 1998; Must and Strauss, 1999). Furthermore, higher levels of physical fitness and physical activity are, independently of weight and other key factors, associated with reduced risk of cardiovascular disease, diabetes and all-cause mortality in adults (Blair *et al.*, 1996, 1989; Lee *et al.*, 1999). It is possible, that a similar relationship exists in children and adolescents but this has yet to be fully explored.

The National Physical Fitness Survey (NPFS), conducted by the National Council on Physical Fitness and Sports (NCPFS) in Taiwan in 1999 and repeated in 2001 provides an opportunity to study the prevalence of overweight and obesity in nationally representative samples of 6–18 year olds. Measured height and weight are available alongside measures of components of physical fitness and blood pressure. This offers a unique opportunity to study the interrelationships between weight status, elements of physical fitness and hypertension as early indicators of ill health. The specific purposes of this study were therefore to (1) determine the prevalence of childhood and adolescent obesity in Taiwan, showing the development of the obesity prevalence from 1999 to 2001 and offering international comparisons, (2) examine the relation between obesity/cardiovascular fitness and blood pressure and (3) compare fitness levels between overweight/obese and normal weight adolescents in Taiwan.

Materials and methods

Sample

The NPFS was conducted by the NCPFS in Taiwan in 1999 and repeated in 2001. A stratification random method was used to select the sample based on the resident population in Taiwan. In the first sampling phase, Taiwan was divided into 25 district regions (18 counties and seven cities). After stratification, the sample size was selected according to the proportion of the population by gender and age in each district region.

A total of 20 686 individuals aged 6–65 years were available in the 1999 NPFS and 42 412 in the 2001 NPFS. For this study, only those aged 6–18 years (inclusive) of age were included. In the 1999 survey, participants were 13 935, of whom 7031 were boys and 6904 were girls. A total of 24 586 individuals were involved in the 2001 survey, including 12 367 boys and 12 219 girls. For the purposes of this study, respondents were categorized by age into children (age 6–11 years), early adolescents (age 12–14 years) and late adolescents (age 15–18 years).

Measures

The NPFS was a health-related physical fitness survey used to establish the norms of physical fitness for people aged 6–65 years. Measures were taken by assistants who had attended a regional training seminar and passed a certification test on standardized procedures. Inspectors from the NCPFS and universities visited each site to supervise progress. The survey included four measures: (Taiwan National Council on Physical Fitness and Sports, 1999, 2001).

Weight and height were obtained using a stadiometer and digital or balance beam scale. All instruments had been verified and approved by the Taiwan Bureau of Standards, Metrology and Inspection. Participants wore light clothes without shoes.

Systolic and diastolic blood pressures were measured using a cuff sphygmomanometer at the right arm before all fitness tests. Data for children and adolescents were available in the 2001 survey only. Participants were classified in the 'hypertension' group if their systolic pressure was $\geqslant$140 mm Hg and/or diastolic pressure $\geqslant$90mm Hg and all others were classed as the 'normal' group (World Health Organization, 2003; Burke *et al.*, 2004).

Several tests were used to assess the main components of health-related fitness:

(i) The number of bent-leg curl-ups attained in 1 min was used to test abdominal muscle strength and endurance (Chen *et al.*, 2002; Huang and Malina, 2002).

(ii) The standardized sit-and-reach test was used to measure the lower back and hip joint flexibility (Chen *et al.*, 2002; Huang and Malina, 2002; American College of Sports Medicine, 2003; Ozdirenc *et al.*, 2005).

(iii) A 3-min step test was used to assess cardiovascular endurance. This involved participants stepping at a rate of 24 steps/min onto a 35 cm high bench. A cardiovascular index (CI) was obtained by the following formula:

$$CI = \frac{\text{Time} \times 100}{(\sum \text{pulse}) \times 2}$$

where Time is the duration of exercise period in seconds and $\sum$pulse is the sum of 3 half-minute pulse counts (1–1 1/2, 2–2 1/2, 3–3 1/2 min) during recovery (Bosco and Gustafson, 1983; Heyward, 1991).

After the tests, participants were given the results and advice from professional instructors, and also received mementos. The full details of research design, sampling procedures and data collection methods have been described elsewhere (Taiwan National Council on Physical Fitness and Sports, 1999, 2001).

Statistical analyses

All the statistical analyses were carried out using the SPSS 12.0. statistical package. Very few missing data were found in the weight, height and fitness measures (range from 0 to 0.56% of the sample). The potential outliers were also examined with cases having standardized scores in excess of 3.29 (Tabachnick and Fidell, 2001) but the incidence of outliers was not greater than 0.8% (Fiel, 2005) for any variable.

BMI was calculated as weight in kilograms divided by the square of height in meters (kg/m^2) using measured weight and height. The International Obesity Task Force criteria (Cole *et al.*, 2000) were used to determine normal, overweight and obesity classifications at each age and for each gender.

Descriptive statistics for age, gender, weight, height and BMI were calculated to characterize the respondents. Differences in the prevalence of overweight and obesity in 1999 and 2001 were assessed using cross tabulation by age group and gender. As low obesity prevalence was consistently found (particularly in girls), both the overweight and obesity figures were combined and subsequently referred to as 'overweight/obesity prevalence'. Differences in overweight/obesity prevalence between the two surveys were assessed for significance using *Z*-tests. Analysis of variance (ANOVA) was used to examine differences in fitness results among age group, gender and BMI category.

To examine the independent impact of fitness and obesity on the risk of hypertension, multivariate logistic regression analysis was conducted with age group, gender, BMI category and cardiorespiratory fitness level as the independent predictor variables. Participants in the extreme quartiles within each age and gender were classified as 'unfit'(the lowest quartile) and 'fit'(the highest quartile) (Huang and Malina, 2002).

Results

Prevalence of overweight and obesity

Prevalence of overweight and obesity (categorized by IOTF criteria) and mean BMI by gender and age group, for each of the two surveys is shown in Table 1. The overall prevalence of overweight in boys was 14.1% in 1999 and 18.6% in 2001. Among girls, it remained at about 13% in both surveys. The overall obesity prevalence for boys was 5.7% in 1999 and 8.2% in 2001. It was lower in girls with 2.4% in 1999 and 3.6% in 2001.

Prevalence of overweight/obesity was significantly higher in boys than girls across all age groups in both surveys ($P<0.01$). Within each survey, a significant reduction in prevalence with age is seen. The group with least incidence is adolescent girls aged 15–18 years. Results are therefore consistent across the two surveys giving confidence in their reliability.

Even across this 2-year period, there are indications of trends for increasing fatness among the population. For boys, weight, height and BMI increased significantly ($P<0.01$) in each group across the two time points. Among girls, a significant increase was also observed in weight

and height in every age group over the 2-year period except the group aged 15–18 years where weight declined significantly. A significant increase in BMI was found only in the 12- to 14-year-old girls from 1999 to 2001. In contrast, girls aged 15–18 years showed a significant decrease in BMI. Combining the prevalence of overweight and obesity, the prevalence increased significantly for both genders across all age groups through 2 years, except 15- to 18-year-old girls with significant decrease in overweight/obesity prevalence.

Associations between obesity and physical fitness

Table 2 shows the means for each of the fitness tests. The normal weight group performed better ($P<0.05$) than the overweight/obese group in all tests in both surveys except in the 2001 sit-and-reach test where there were no differences between the two groups.

There was a significant interaction in both data sets between obesity and age for the step test. This revealed that the normal weight group had better performance than the overweight/obese group and that this difference was greater

Table 1 BMI and prevalence (%) of overweight and obesity

	Sample size		*BMI (s.d.)*		*Overweight (%)*		*Obese (%)*		*Overweight/obesity (%)*		
	1999	*2001*	*1999*	*2001*	*1999*	*2001*	*1999*	*2001*	*1999*	*2001*	*Z- test*[a]
Boys (years)											*P*
6–11	3069	6275	17.7 (3.0)	18.0 (3.7)	15.3	19.5	7.3	10.0	22.6	29.5	<0.001
12–14	1997	2877	19.9 (3.4)	20.2 (4.0)	15.8	20.2	5.6	7.5	21.4	27.6	<0.001
15–18	1965	3215	21.3 (3.3)	21.6 (4.0)	10.5	15.6	3.3	5.3	13.8	20.8	<0.001
Subtotal	7031	12367	19.3 (3.5)	19.4 (4.1)	14.1	18.6	5.7	8.2	19.8	26.8	<0.001
Girls (years)											
6–11	3040	5622	17.2 (2.6)	17.1 (3.1)	15.3	17.1	3.7	4.9	18.9	22.0	0.0020
12–14	1717	2538	19.2 (2.8)	19.7 (3.7)	13.9	13.4	0.3	3.6	14.2	17.1	0.0286
15–18	2147	4059	21.0 (3.2)	20.5 (3.0)	8.4	7.1	2.1	1.7	10.6	8.7	0.0470
Subtotal	6904	12219	18.9 (3.3)	18.8 (3.5)	12.8	13.0	2.4	3.6	15.2	16.5	0.0470

[a]Significance in overweight/obesity differences between 1999 and 2001 surveys.
Abbreviation: BMI, body mass index.

Table 2 Means in fitness for overweight/obese and normal weight groups

	Sample size		*Bent-leg curl-ups (s.d.)*		*Sit-and-reach (s.d.)*		*Step test (s.d.)*	
	Overweight/obese	*Normal weight*	*Overweight/obese*	*Normal weight*	*Overweight/obese*	*Normal weight*	*Overweight/obese*	*Normal weight*
1999								
Boys (years)								
6–11	694	2375	18.1 (10.0)	22.4 (9.0)	26.2 (8.1)	26.8 (7.5)	53.9 (10.6)	58.8 (10.5)
12–14	427	1570	27.1 (8.4)	32.2 (8.1)	24.6 (8.5)	26.0 (8.9)	58.1 (9.7)	60.8 (10.1)
15–18	271	1694	32.3 (8.0)	35.0 (7.4)	24.6 (9.6)	26.6 (9.6)	57.6 (8.7)	60.5 (9.7)
Subtotal	1392	5639	23.6 (10.8)	28.9 (10.0)	25.4 (8.5)	26.5 (8.6)	55.9 (10.2)	59.9 (10.2)
Girls (years)								
6–11	569	2465	19.8 (9.2)	20.4 (9.1)	29.0 (8.8)	30.1 (7.8)	51.0 (9.1)	55.6 (10.0)
12–14	244	1473	24.3 (7.1)	25.8 (7.1)	28.6 (8.6)	27.6 (8.4)	52.8 (7.9)	57.0 (9.6)
15–18	227	1920	23.1 (10.0)	25.9 (7.7)	29.8 (10,5)	28.7 (10.5)	51.9 (8.8)	53.1 (9.1)
Subtotal	1040	5858	21.6 (9.2)	23.5 (8.6)	29.1 (9.1)	29.0 (9.0)	51.6 (8.8)	55.1 (9.7)
2001								
Boys (years)								
6–11	1850	4417	21.8 (9.5)	23.2 (9.3)	26.5 (11.3)	26.0 (8.8)	53.8 (9.4)	59.3 (9.2)
12–14	795	2079	31.8 (8.8)	35.3 (8.4)	26.3 (11.4)	26.2 (11.9)	54.5 (8.7)	58.6 (10.1)
15–18	668	2546	35.6 (8.3)	39.5 (8.6)	28.2 (10.1)	27.8 (11.9)	53.7 (8.5)	56.7 (9.2)
Subtotal	3313	9042	27.0 (10.9)	30.6 (11.6)	26.8 (11.1)	26.6 (10.5)	54.0 (9.0)	58.4 (9.5)
Girls (years)								
6–11	1234	4384	19.4 (9.0)	21.2 (8.8)	29.3 (11.1)	28.9 (9.0)	53.2 (8.8)	56.7 (8.8)
12–14	433	2104	26.2 (8.0)	29.0 (8.1)	30.9 (8.5)	30.1 (16.5)	50.6 (8.6)	53.8 (8.7)
15–18	354	3703	27.5 (8.8)	28.9 (8.7)	30.8 (9.2)	31.1 (12.8)	51.2 (7.9)	53.1 (9.1)
Subtotal	2021	10191	22.3 (9.5)	25.6 (9.4)	29.9 (10.3)	29.9 (12.3)	52.3 (8.7)	54.8 (9.0)

Table 3 Means in blood pressure for overweight/obese and normal weight groups

	Sample size		*Systolic pressure (s.d.)*		*Diastolic pressure (s.d.)*	
	Overweight/obese	*Normal weight*	*Overweight/obese*	*Normal weight*	*Overweight/obese*	*Normal weight*
Boys (years)						
6–11	1852	4423	106.9 (16.1)	98.6 (16.4)	71.9 (15.7)	64.8 (14.6)
12–14	795	2082	120.4 (16.1)	112.1 (14.9)	76.8 (15.3)	72.0 (13.0)
15–18	669	2546	127.4 (14.8)	119.3 (74.5)	78.8 (14.1)	74.5 (11.6)
Subtotal	3316	9051	114.3 (18.1)	107.5 (18.0)	74.4 (15.6)	69.2 (14.1)
Girls (years)						
6–11	1235	4387	104.5 (17.8)	98.4 (16.8)	70.9 (16.9)	65.4 (15.0)
12–14	433	2105	117.0 (15.1)	108.4 (14.6)	77.8 (13.7)	71.7 (11.8)
15–18	354	3705	119.4 (16.1)	111.3 (13.4)	77.3 (14.3)	72.5 (11.4)
Subtotal	2022	10197	110.0 (18.2)	105.2 (16.3)	73.5 (16.1)	69.3 (13.6)

in children than adolescents in both surveys. The difference in cardiovascular fitness between overweight/obese and normal children therefore decreases into adolescence.

A significant interaction between obesity and gender in the bent-leg curl-ups test showed that the difference between overweight/obese and normal weight groups was greater for boys than girls. This interaction effect was also seen for step test results in the 2001 data and for the sit-and-reach test in the 1999 data. This is perhaps explained by the greater incidence and severity of obesity in the boys when compared to girls.

Obesity, cardiorespiratory fitness and blood pressure

Blood pressure data were available only for the 2001 survey. Table 3 shows the means of systolic and diastolic blood pressures for overweight/obese and normal weight groups. The overweight/obese group had significant higher systolic and diastolic pressures in both genders and in all age groups (all $P<0.001$).

Age group, gender, BMI category and cardiorespiratory fitness level were entered into a multivariate logistic regression analysis with incidence of hypertension as the dependent variable. The results showed that children and girls had lower odds of hypertension than 15- to 18-year-old adolescents and boys (AOR=0.61, 95%CI=0.525–0.704 and AOR=0.80, 95%CI=0.702–0.906, respectively). The overweight/obese group had over twice higher odds of hypertension than the normal weight group (AOR=2.28, 95%CI=1.983–2.611). The cardiovascular unfit group was nearly 30% more likely to suffer hypertension than the fit group (AOR=1.28, 95%CI=1.121–1.455). Fitness is therefore associated with lower risk of hypertension.

In order to examine whether or not there was a significant association with hypertension between unfit and fit groups within each BMI category, participants were categorized by BMI category across cardiorespiratory fitness level. The results revealed that the normal weight-fit boys had a significantly lower risk of hypertension than the normal weight-unfit, overweight/obese-fit and overweight/obese-unfit boys (AOR=1.26, 95%CI=1.015–1.567, AOR=1.79, 95%CI=1.311–2.441, and AOR=2.76, 95%CI=2.244–3.394, respectively). The normal weight-fit girls had lower risk of hypertension than the overweight/obese-fit and overweight/obese-unfit girls (AOR=1.97, 95%CI=1352-2.872 and AOR=2.73, 95%CI=2.108–3.531, respectively).

With the data of boys and girls combined, the results in Table 4 and Figure 1 revealed that the normal weight-unfit group was more likely to experience hypertension than the normal weight-fit group (AOR=1.19, 95%CI=1.015-1.387). The risk of hypertension increased nearly two times for the overweight/obese-fit group and nearly three times for the overweight/obese-unfit group compared to the normal weight-fit group (AOR=1.93, 95%CI=1.514-2.451 and AOR=2.93, 95%CI=2.493–3.454, respectively). However, these differences were not all significant when analysed separately by gender.

Discussion

Prevalence of overweight/obesity

Although direct comparison of overweight and obesity prevalence with children from other countries is difficult due to differences in the methods used for measurement of adiposity, the classifications of obesity, and the examined ages of the samples, some studies (Table 5) have been selected for comparisons with large samples using IOTF criteria in similar time period among children and adolescents. Some caution is required on interpretation of this table as BMI is partly dependent on body proportions which normatively vary across nations and ethnic groups. However, the original IOTF sample did include samples from Hong Kong and Singapore so have some direct relevance.

The results show that the overweight and obesity prevalence in boys is similar to the reported figures in the UK and US and higher than that found in Japan. The prevalence in girls is much lower than that in the US and UK and similar

Table 4 Multivariate logistic regression for predicting risk of hypertension by BMI category and cardiorespiratory fitness level

Variable	N	*Hypertension*[a] *(%)*	*Multivariate model*		
			AOR[b]	*CI95%*	P
Age (years)					
Age 6–11	9811	8.6	0.60	0.521–0.699	<0.001
Age 12–14	4561	11.8	0.88	0.749–1.043	0.145
Age 15–18	6055	12.6	1		
Gender					
Girls	10413	9.0	0.80	0.705–0.910	0.001
Boys	10014	12.0	1		
BMI category-fitness					
Overweight/obese-unfit	1703	20.0	2.93	2.493–3.454	<0.001
Overweight/obese-fit	682	14.4	1.93	1.514–2.451	<0.001
Normal-unfit	3439	9.7	1.19	1.015–1.387	0.032
Normal-fit	4465	8.2	1		

[a]Systolic pressure > 140 and/or diastolic pressure > 90.
[b]Adjusted odds ratio.
Abbreviation: BMI, body mass index.

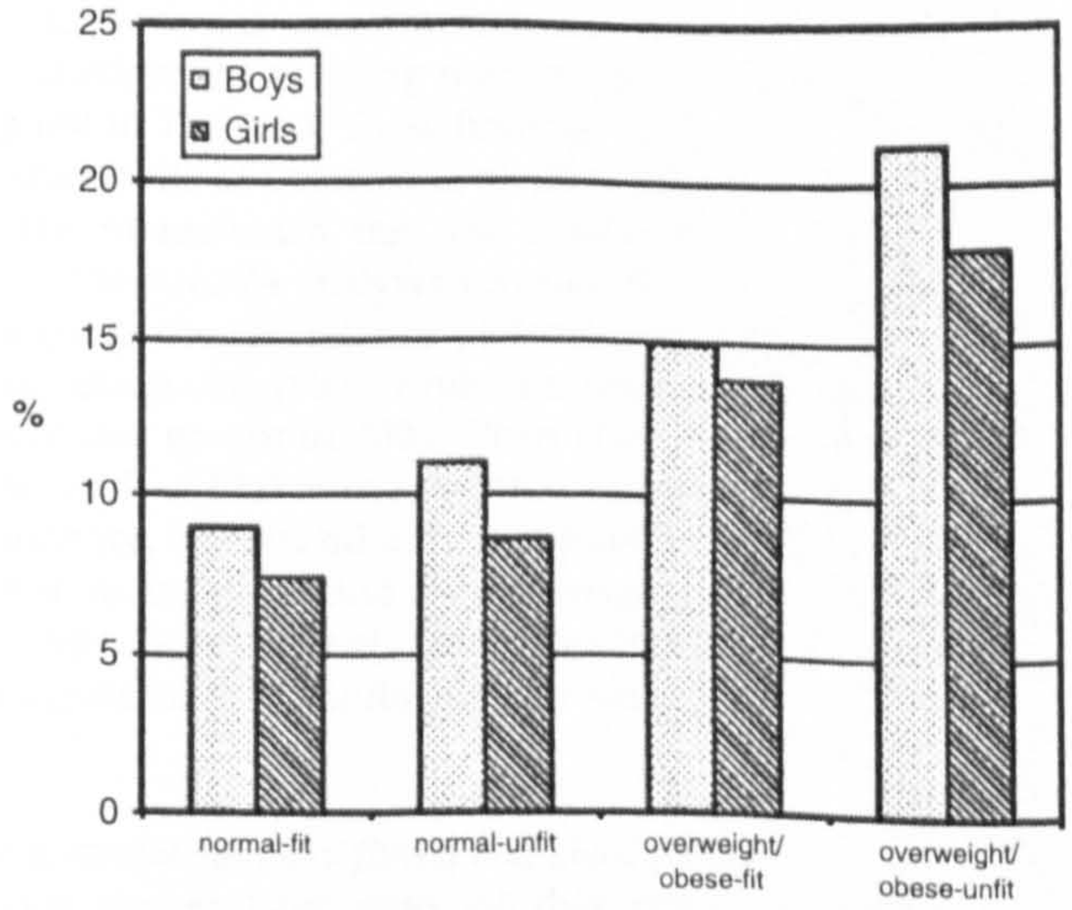

Figure 1 Percentage experiencing hypertension by BMI category and cardiorespiratory fitness level.

to the figures in Japan (Wang and Wang, 2002; UK Department of Health, 2003; Matsushita *et al.*, 2004). The finding of a higher prevalence of overweight/obesity in children than in adolescents reflects similar findings in China (Wang, 2001; Wang *et al.*, 2002). It may be possible that the growth in obesity is so recent that it has primarily affected children. In addition, this study showed that the overweight/obesity prevalence in boys was significantly higher than that in girls, which has also been noted in other studies from Singapore (Fu *et al.*, 2003) and China (Wang *et al.*, 2002; Hui and Bell, 2003). This is in contrast to most Western countries. Hui and Bell (2003) indicated that differences in obesity prevalence between boys and girls are not usually marked with girls tending to have higher prevalence than boys.

There are many contributors to the development of obesity, for example lack of physical activity, sedentary behaviours (e.g. television watching and easily available foods rich in energy and fat (Wabitsch, 2000; Calderon *et al.*, 2005). This study found that older adolescent girls were less obese than other subgroups. Previous studies have demonstrated that physical activity decreases with age during adolescence and boys are more active than girls (Stone *et al.*, 1998; Sallis *et al.*, 2000; Huang and Malina, 2002). It is uncertain whether or not there are differences in eating habits between Taiwanese boys and girls. It is likely therefore that older adolescent girls are investing more overtly in weight control behaviours such as controlling energy intake compared with children and adolescent boys, perhaps as a response to the influence of cultural pressures to be slim (Wang *et al.*, 2002). Studies have indicated that body dissatisfaction becomes more pronounced with increasing age for adolescent girls (Kaneko *et al.*, 1999; Ricciardelli and McCabe, 2001). Different cultural pressures to be slim are present in eastern cultures. Confucianism has had a strong influence in Taiwan as a male dominated patriarchal society (Slack *et al.*, 2002; Yu *et al.*, 2004). Men are depicted as strong and women as petite, feminine and in need of protection. Western cultural influences that are increasingly experienced in Taiwan, particularly in cities, may provide added pressures to the traditional values of feminity and petiteness. Despite these suggestions, the reasons for age and gender differences in this national sample remain unclear. Longitudinal studies are needed to track weight and height in preadolescents to young adults and to investigate influences of lifestyles and cultural values regarding the body alongside each other.

Table 5 Comparison of obesity prevalence from various countries (IOTF reference)

Country	*Study*	*Year*	*Age years*	*Sample size*	*Boy (%)*			*Girl (%)*		
					Overweight	*Obesity*	*Total*	*Overweight*	*Obesity*	*Total*
Taiwan	NCPFS (This study)	2001	6–18	24586	18.6	8.2	26.8	13.0	3.6	16.5
			12–18	12689	17.7	6.3	24.0	9.5	2.4	11.9
Japan	Matsushita *et al.* (2004)	1996–2000	9–11	6079 (Age 6–14 years)	18.4	4.0	22.4	17.2	3.0	20.2
			12–14	6079 (Age 6–14 years)	14.9	2.7	17.6	11.2	1.0	12.2
UK	UK Department of Health, (2003)	2002	*2–15*	*6390*	*16.3*	*5.5*	*21.8*	*20.3*	*7.2*	*27.5*
			11–15	2406	17.8	6.4	24.2	21.2	7.6	28.8
US	Wang and Wang (2002)	1988–1994	6–9	2169			20.5			23.6
			10–18	3939			26.8			27.5

Abbreviation: NCPFS, National Council on Physical Fitness and Sports.

Obesity and physical fitness

In the present study, overweight/obese group had poorer performances in bent-leg curl-ups test (muscular endurance) and step test (cardiorespiratory fitness) in both surveys. These results are consistent with other studies. Pongprapai *et al.* (1994) found that physical fitness was worse among obese children than among normal weight children in the sit-up test in Thailand. These findings are also in agreement with the results of Deforche *et al.* (2003) in Flemish youth.

In the sit-and-reach test, the results were more inconsistent. The ANOVA analyses revealed that the overweight/obese group showed inferior performance than the normal weight group in 1999, while no difference was found between two groups in 2001. Chen *et al.* (2002) found that higher levels of BMI were associated with poor sit-and-reach performance, whereas other studies showed no differences in this test among obese and normal weight boys (Pongprapai *et al.*, 1994; Deforche *et al.*, 2003). Flexibility therefore seems to be consistently less influenced by weight.

Obesity, cardiorespiratory fitness and blood pressure

Previous studies have reported that obese children and adolescents had significantly higher blood pressure than the normal weight group (Chu *et al.*, 1998; Reich *et al.*, 2003; Burke *et al.*, 2004). However, there has been less attention paid to the interactions among obesity, fitness and blood pressure in children and adolescents although this has been a feature of research with adults. Prospective studies have indicated that keeping or becoming fit is associated with subsequent reduced risk of mortality and morbidity in obese adults (Lee *et al.*, 1999; Brodney *et al.*, 2000). This study examined obesity and blood pressure (hypertension) taking cardiorespiratory fitness into consideration. The results revealed that the normal weight-fit group had lower risk of hypertension than the overweight/obese individuals whether they were unfit or fit in both genders. When putting boys and girls together, it was found that the overweight/obese youngsters who were unfit were at significantly higher level of risk than those who were fit. These relationships are cross-sectional but support the findings with adults that being fit as an overweight or obese person is associated with reduced risk of various aspects of morbidity (Lee *et al.*, 1999). The failure to reach significance when analysed separately by gender might be due to the lack of power as numbers of overweight/obese-unfit group were reduced to 278 for girls and 404 for boys.

The authors were also aware of the lack of foundation for the definition of hypertension. In children and adolescents, blood pressure standards may be based on gender, age and height to provide a more precise classification of blood pressure (National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents, 2004). However, current charts are based on a US population and unlikely to be valid throughout the rest of the world (Materson, 2003). A study showed that there are geographical and ethnic variations in blood pressure in adolescents, indicating that acceptance and use of nonpopulation-specific blood pressure distribution may lead to under-or overdiagnosis of hypertension (Pall *et al.*, 2003). In Taiwan, there remain no published cut-points for hypertension in children and adolescents currently and the government have adopted the adult criteria of 140/90 mmHg (Taiwan Department of Health, 2004). Future research is required to provide valid characterization of hypertension in the Chinese adolescent population before the effect of excess weight and lack of fitness can be fully determined.

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References

American College of Sports Medicine (2003). *ACSM Fitness Book*, 3rd edn. Human Kinetics: Champaign.

Blair SN, Kohl III HW, Paffenberger RS, Clark DG, Gibbons LW (1989). Physical fitness and all-cause mortality: a prospective study of healthy men and women. *JAMA* 262 (17), 2395–2401.

Blair SN, Kampert JB, Kohl III HW, Barlow CE, Macera CA, Paffenbarger RS *et al.* (1996). Influences of cardioreapiratory fitness and other precursors on cardiovascular disease and all-cause mortality in men and women. *JAMA* 276, 205–210.

Bosco JS, Gustafson WF (1983). *Measurement and Evaluation in Physical Education, Fitness, and Sports*. Prentice-Hall: New Jersey.

Brodney S, Blair SN, Lee CD (2000). Is it possible to be overweight or obese and fit and healthy?. In: Bouchard C (ed). *Physical Activity and Obesity*. Human Kinetics: Champaign, 355–371.

Burke V, Beilin LJ, Dunbar D, Kevan M (2004). Associations between blood pressure and overweight defined by new standards for body mass index in childhood. *Prev Med* 38, 558–564.

Calderon KS, Yucha CB, Schaffer SD (2005). Obesity-related cardiovascular risk factors: intervention recommendations to decrease adolescent obesity. *J Pediatr Nurs* 20 (1), 3–14.

Chen W, Wu KW, Mi LL, Liu JL (1993). Weight-for-length index in evaluation of children's body weight status: a simple and accurate method. *J Formos Med Assoc (Taiwan)* 92 (Suppl 3), S128–S134.

Chen W, Lin CC, Peng CT, Li CI, Wu HC, Chiang J *et al.* (2002). Approaching healthy body mass index norms for children and adolescents from health-related physical fitness. *Obes Rev* 3, 225–232.

Chu NF (2004). Prevalence of obesity in Taiwan. In: Department of Health (ed). *Symposium on Nutrition Monitoring and Health Policy Development*. Department of Health: Taiwan.

Chu N, Rimm EB, Wang D, Liou H, Shieh S (1998). Clustering of cardiovascular disease risk factors among obese schoolchildren: the Taipei Heart Study. *Am J Clin Nutr* 67, 1141–1146.

Chu NF (2001). Prevalence and trends of obesity among school children in Taiwan – the Taipei Children Heart Study. *Int J Obes Relat Metab Disord* 25, 170–176.

Chu NF (2005). Prevalence of obesity in Taiwan. *Obes Rev* 6, 271–274.

Cole TJ, Bellizzi MC, Flegal KM, Dietz WH (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 320, 1240–1243.

Deforche B, Lefevre J, De Bourdeaudhuij I, Hills AP, Duquet W, Bouckaert J (2003). Physical fitness and physical activity in obese and nonobese Flemish youth. *Obes Res* 11 (3), 434–441.

Department of Health and Human Service (2001). Surgeon general's call to action to prevent and decrease overweight and obesity. US Department of Health and Human Service, Public Health Service, Office of the Surgeon General.

Dietz WH (1998). Health consequences of obesity in youth: childhood predictors of adult disease. *Pediatrics* 101 (3), 518–525.

Edmunds L, Waters E, Elliott EJ (2001). Evidence based paediatrics: evidence based management of childhood obesity. *BMJ* 323, 916–919.

Fiel A (2005). *Discovering Statistics Using SPSS* 2nd edn. SAGE: London.

Fu WP, Lee HC, Ng CJ, Tay YK, Kau CY, Seow CJ *et al.* (2003). Screening for childhood obesity: international vs population-specific definitions. Which is more appropriate? *Int J Obes Relat Metab Disord* 27, 1121–1126.

Fu C, Yeh J, Pei D, Lin HH, Lo H (2004). Prevalence of overweight adolescents and associated factors in Hualien city. *Tzu Chi Med J (Taiwan)* 16 (5), 301–307.

Heyward VH (1991). *Advanced Fitness Assessment and Exercise Prescription*. Human Kinetics: Champaign.

Hsieh P-L, FitzGerald M (2005). Childhood obesity in Taiwan: review of the Taiwanese literature. *Nurs Health Sci* 7, 134–142.

Huang YC, Wu JY (2000). Weight-for-height reference among school children aged 6.5–18.5 in Taiwan. *Public Health (Taiwan)* 27 (3), 167–177.

Huang YC, Malina RM (2002). Physical activity and health-related physical fitness in Taiwanese adolescents. *Physiol Anthropol Appl Human Sci* 21 (1), 11–19.

Huang YC, Wu JY, Yang MJ (2003). Weight-for-height reference and the prevalence of obesity for school children and adolescents in Taiwan and Fuchien Areas. *J Chin Med Assoc (Taiwan)* 66 (10), 599–606.

Hui L, Bell AC (2003). Overweight and obesity in children from Shenzhen, People Republic of China. *Health Place* 9, 371–376.

International Obesity Task Force (2002) Obesity in the Pacific-Too big to ignore: International Obesity Task Force Asia Pacific Office.

Kaneko K, Kiriike N, Ikenaga K, Miyawaki D, Yamagami S (1999). Weight and shape concerns and dieting behaviours among pre-adolescents and adolescents in Japan. *Psychiatry Clin Neurosci* 53 (3), 365–371.

Kim DM, Ahn CW, Nam SY (2005). Prevalence of obesity in Korea. *Obes Rev* 6 (2), 117–121.

Lee L, Pan WH, Chen CH, Lee YM (1994). The prevalence of obesity in the seven grades in Taipei city, 1991: a comparison of various body screening indices. *CJPH (Taiwan)* 13 (1), 11–19.

Lee YM (1995). Prevalence of obesity among high school students in Hualien city: a comparison between weight-length index and body mass index. *Chin J Fam Med (Taiwan)* 5 (3), 128–135.

Lee CM, Lee MC (1997). Obesity in adolescents. *Healthy World (Taiwan)* 138, 97–109.

Lee CD, Blair SN, Jackson AS (1999). Cardiorespiratory fitness, body composition, and all-cause and cardiovascular disease mortality in men. *Am J Clin Nutr* 69, 373–380.

Lin CC, Lai MM, Liu CS, Li TC (1998). The prevalence of obesity in the school-aged children in Taichung city: a comparison of various body anthropometric indices. *Chin J Fam Med (Taiwan)* 8, 134–143.

Livingstone B (2000). Epidemiology of childhood obesity in Europe. *Eur J Pediatr* 159 (Suppl: 1), S14–34.

Lobstein T, Frelut ML (2003). Prevalence of overweight among children in Europe. *Obes Rev* 4, 195–200.

Lobstein T, Baur L, Uauy R (2004). Obesity in children and young people: a crisis in public health. *Obes Rev* 5 (Suppl: 1), 4–85.

Loke KY (2002). Consequences of childhood and adolescents obesity. *Asia Pacific J Clin Nutr* 11 (3), S702–S704.

Materson BJ (2003). What defines an adolescent as having hypertension? *J Hypertens* 21, 13–14.

Matsushita Y, Yoshiike N, Kaneda F, Yoshita K, Takimoto H (2004). Trends in childhood obesity in Japan over the last 25 year from the national nutrition survey. *Obes Res* 12 (2), 205–214.

Must A, Strauss RS (1999). Risks and consequences of childhood and adolescent obesity. *Int J Obes* 23 (Suppl: 2), S2–S11.

National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents (2004). The fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. *Pediatrics* 114 (Suppl), 555–576.

North American Association for The Study of Obesity (2003). Childhood obesity. [cited 2005 17 April]; Available from:www.naaso.org/information/childhood_overweight.asp.

Ozdirenc M, Ozcan A, Akin F, Gelecek N (2005). Physical fitness in rural children compared with urban children in Turkey. *Pediatr Int* 47 (1), 26–31.

Pall D, Katona E, Fulesdi B, Zrinyi M, Zatik J, Bereczki D *et al.* (2003). Blood pressure distribution in a Hungarian adolescent population: comparison with normal values in the USA. *J Hypertens* 21, 41–47.

Pongprapai S, Mo-suwan L, Leelasamran W (1994). Physical fitness of obese school children in Hat Yai, southern Thailand. *Southeast Asian J Trop Med Public Health* 25 (2), 354–360.

Reich A, Müller G, Gelbrich G, Deutscher K, Gödicke R, Kiess W (2003). Obesity and blood pressure: results from the examination of 2365 schoolchildren in Germany. *Int J Obes* 27 (12), 1459–1464.

Ricciardelli LA, McCabe MP (2001). Children's body image concerns and eating disturbance: a review of the literature. *Clin Psychol Rev* 21 (3), 325–344.

Sallis JF, Prochaska JJ, Taylor WC (2000). A review of correlates of physical activity of children and adolescents. *Med Sci Sports Exerc* 32 (5), 963–975.

Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T (1993). Do obese children become obese adults? a review of the literature. *Prev Med* 22 (2), 167–177.

Slack T, Hsu Y, Tsai C, Hong F (2002). The road to modernisation: sport in Taiwan. *Int J Hist Sport* 19, 343–365.

Stone EJ, McKenzie TH, Welk GJ, Booth ML (1998). Effects of physical activity intervention in youth. *Am J Prev Med* 15 (4), 298–315.

Tabachnick BG, Fidell LS (2001). *Using Multivariate Statistics*. Allyn & Bacon: London.

Taiwan Department of Health (2004) Hypertension in Taiwan.

Taiwan National Council on Physical Fitness and Sports (1999). *National Physical Fitness Survey*. National Council on Physical Fitness and Sports: Taiwan.

Taiwan National Council on Physical Fitness and Sports (2001). *National Physical Fitness Survey*. National Council on Physical Fitness and Sports: Taiwan.

Taiwan National Institute for the Health Research (2001). *Physical activity and children and adolescent obesity*. Taiwan National Institute for the Health Research: Taipei.

UK Department of Health (2003). *Health Survey for England 2002*. The Stationery Office: London.

Vanhala M, Vanhala P, Kumpusalo E, Halonen P, Takala J (1998). Relation between obesity from childhood to adulthood and the metabolic syndrome: population based study. *BMJ* 317, 319.

Wabitsch M (2000a). Overweight and obesity in European children: definition and diagnostic procedures, risk factors and consequences for later health outcome. *Eur J Pediatr* 159 (Suppl 1), S8–S13.

Wabitsch M (2000b). Overweight and obesity in European children and adolescents: causes and consequences, treatment and prevention. *An introduction. Eur J Pediatr* 159 (Suppl 1), S5–S7.

Wang Y (2001). Cross-national comparison of childhood obesity: the epidemic and the relationship between obesity and socio-economic status. *Int J Epidemiol* 30, 1129–1136.

Wang Y, Wang JQ (2002). A comparison of international references for assessment of child and adolescent overweight and obesity in different populations. *Eur J Clin Nutr* 56, 973–982.

Wang Y, Monteiro C, Popkin BM (2002). Trends of obesity and underweight in older children and adolescents in the United States, Brazil, China and Russia. *Am J Clin Nutr* 75, 471–474.

World Health Organization (2000). Obesity: preventing and managing the global epidemic- Report of a WHO Consultation. World Health Organization (WHO Technical Report Series, No. 894).

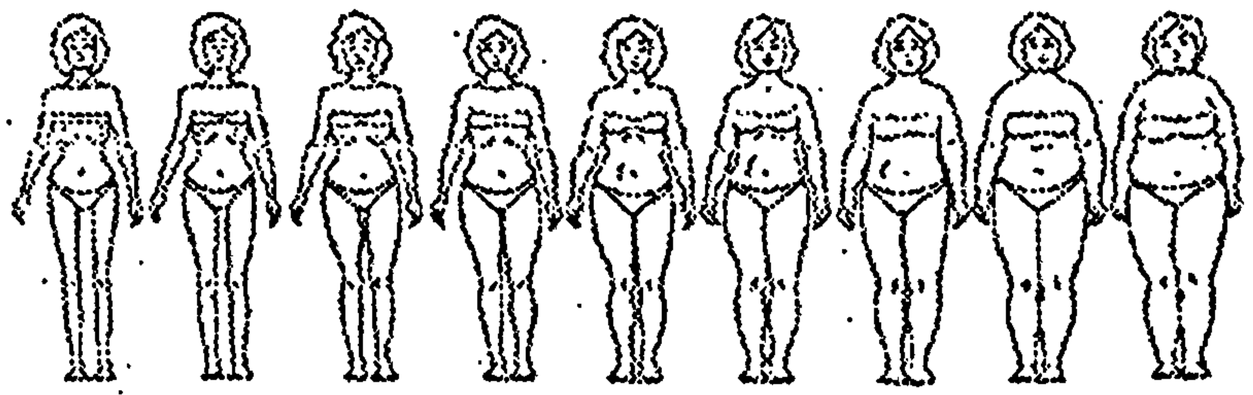
World Health Organization (2003). 2003 World Health Organization (WHO)/International Society of Hypertension (ISH) statement on management of hypertension. *J Hypertens* 21, 1983–1992.

Yu YY (1999). Discussion on obesity. *School Health (Taiwan)* 35, 85–99.

Yu C, Liaw Y, Barnd SM (2004). Cultural and social factors affecting women's physical activity participation in Taiwan. *Sport, Education and Society* 9 (3), 379–393.

Appendix 3: English version of each instrument

Contour Drawing Rating Scale (Girls) (Thompson & Gray, 1995)

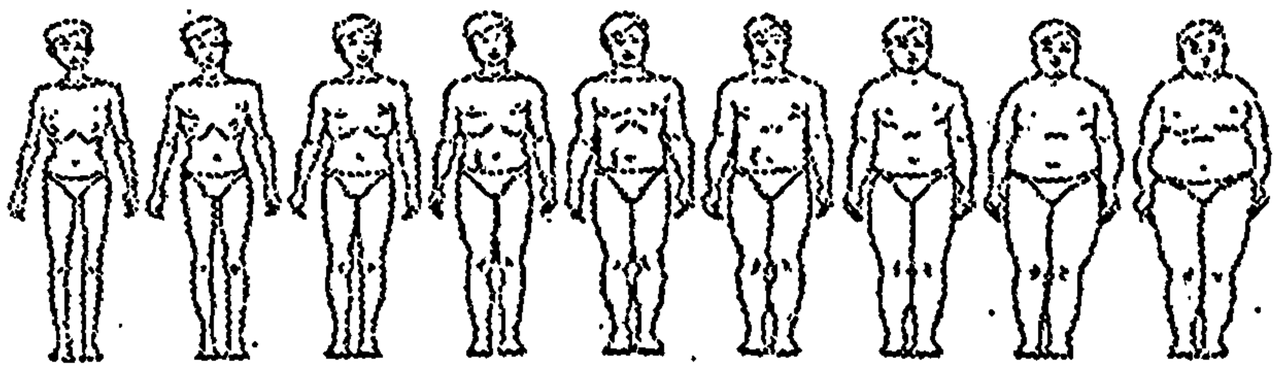


1 2 3 4 5 6 7 8 9

1 Which one reflects how you think you look currently (think)? _____

2 Which one you would like to look like (ideal)? _____

Contour Drawing Rating Scale (Boys) (Thompson & Gray, 1995)



1 2 3 4 5 6 7 8 9

1 Which one reflects how you think you look currently (think)? _____

2 Which one you would like to look like (ideal)? _____

Appearance Evaluation (MBSRQ-AE) (Cash & Pruzinsky, 1990)

1 My body is sexually appealing.
2 I like my looks just the way they are.
3 Most people would consider me good-looking.
4 I like the way I look without my clothes on.
5 I like the way my clothes fit me.
6 I dislike my physique.
7 I am physically unattractive.

Self-esteem (Rosenberg, 1965)

1 On the whole, I am satisfied with myself.
2 At times, I think I am no good at all.
3 I feel that I have a number of good qualities.
4 I am able to do things as well as most other people.
5 I feel I do not have much to be proud of.
6 I certainly feel useless at times.
7 I feel that I'm a person of worth, at least on an equal plane with others.
8 I wish I could have more respect for myself.
9 All in all, I am inclined to feel that I am a failure.
10 I take a positive attitude toward myself.

Perfectionism (EDI-Perfectionism) (Harner, 1991)

1 Only outstanding performance is good enough in my family.
2 As a child, I tried very hard to avoid disappointing my parents and teachers.
3 I hate being less than best at things.
4 My parents have expected excellence of me.
5 I feel that I must do things perfectly or not do them at all.
6 I have extremely high goals.

Socio-cultural Attitudes Towards Appearance Questionnire (Girls) (Smolak, et al., 2001)

1 Women who appear in TV shows and movies have the type of appearance that I see as my goal.
2 I believe that clothes look better on thin models.
3 Music videos that show thin women make me wish that I were thin.
4 I would like to look like the models in the magazines.
5 I tend to compare my body to people in magazines and on TV.
6 In our society, fat people are regarded as unattractive.
7 Photographs of thin women make me wish I were thin.
8 Attractiveness is very important if you want to get ahead in our culture.
9 It's important for people to work hard on their figures/physiques if they want to succeed in today's culture.
10 Most people believe that the thinner you are, the better you look.
11 People think that the thinner you are, the better you look in clothes.
12 In today's society, it is important to always look attractive.
13 I wish I looked like a swimsuit model.
14 I often read magazines like CoCo or Suger and compare my appearance to the models.

Socio-cultural Attitudes Towards Appearance Questionnire (Boys) (Smolak, et al., 2001)

1 Men who appear in TV shows and movies have the type of appearance that I see as my goal.
2 I believe that clothes look better on muscular models.
3 Music videos that show muscular men make me wish that I were muscular.
4 I would like to look like the muscular men who model clothing.
5 I tend to compare my body to people in magazines and on TV.
6 In our society, fat people are regarded as unattractive.
7 Photographs of muscular men make me wish I were muscular.
8 Attractiveness is very important if you want to get ahead in our culture.
9 It's important for people to work hard on their figures/physiques if they want to succeed in today's culture.
10 Most people believe that the more muscular you are, the better you look.
11 People think that the more muscular you are, the better you look in clothes.
12 In today's society, it is important to always look attractive.
13 I wish I looked like a body builder.
14 I often read magazines like Fitness or Sports and compare my appearance to the male models in the magazine.

Appendix 4: Chinese questionnaire

英國布里斯托大學
運動與健康科學研究所

這份問卷將詢問有關你運動與體重控制行爲,及你對身材外表等方面的看法.
我們的問題主要是希望了解這些事情*對一個青少年健康的影響*.
這些問題本身並沒有對或錯的答案. 敬請回答下列各問題,
並從答案中勾選一個最能代表你本身看法與感受的答案.你的答案將會被嚴格保密.

例題:

	非常不同意	不同意	沒意見	同意	非常同意
	1	2	3	4	5
我覺得自己有許多好的特質					

*請在答案中圈選出一個最能代表你看法與感受的答案,
如果你認爲非常同意,就請圈選"非常同意" 數字 5. 謝謝!

請圈選或填入適當的答案

1. 性別: 1 男 2 女

2. 年齡: _____歲

3. 居住地: _____ 鄉 / 鎮 / 市

4. 父親教育程度: 1 小學以下 2 國中 3 高中 4 大專 5 研究所以上
   母親教育程度: 1 小學以下 2 國中 3 高中 4 大專 5 研究所以上

5. 父親職業: _____ 母親職業: _____

6. 目前身高: _____ 公分 體重: _____ 公斤

7. 除了學校體育課外,你平常有運動習慣嗎? 1 有 2 沒有 (請跳到第13題)

8. 平均而言, 你一個星期內運動幾天? _____天

9. 每天大約運動多少時間? _____分鐘

10. 每次運動時,你覺得呼吸:

1 沒什改變 2 呼吸輕微加快 3 有喘氣現象 4 上氣不接下氣

11.你目前有在控制體重嗎? 1 在減重 2 增加體重 3 維持體重 4 沒有控制

12.(a)在過去30天內,你有沒有藉由運動來減肥或避免體重增加?

1 有　　2 沒有

(b)在過去30天內,你有沒有吃的少一點,或吃低卡,低脂的食物來減肥或避免體重增加?

1 有　　2 沒有

(c)在過去30天內,你有沒有節食超過24小時或更多時間來減肥或避免體重增加?

1 有　　2 沒有

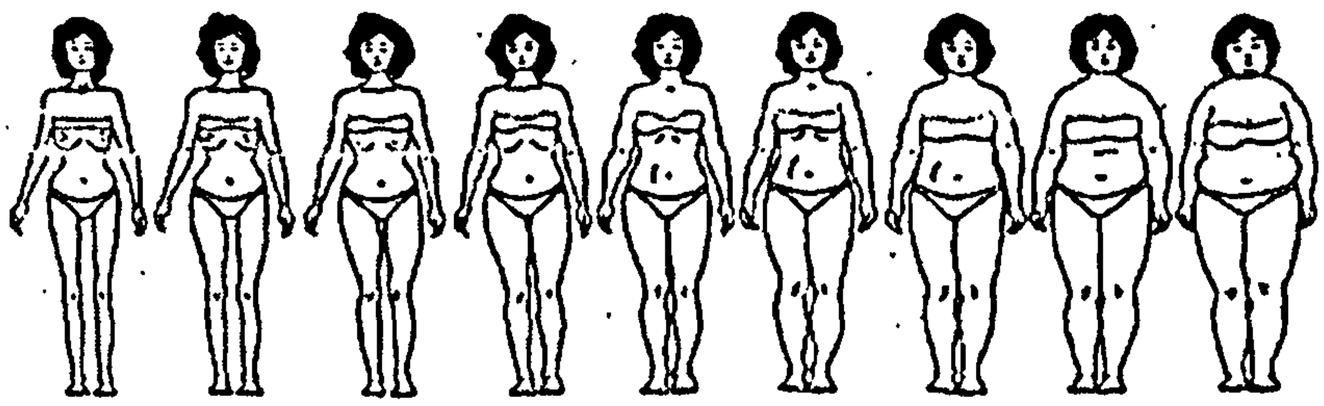
(d)在過去30天內,你有沒有自行服用減肥藥 (沒有經過醫師指示)來減肥或避免體重增加?

1 有　　2 沒有

(e)在過去30天內,你有沒有利用嘔吐或吃瀉藥,來減肥或避免體重增加?

1 有　　2 沒有

請填以下圖形的號碼



1　2　3　4　5　6　7　8　9

13. 你覺得以上哪一個圖形像你現在的體型: _____

14. 你覺得以上哪一個圖形是你想要的體型: _____

請圈選一個代表你感受的答案	非常不同意	不同意	同意	非常同意
15. 整體而言,我對自己感到滿意.	1	2	3	4
16. 有時候,我覺得自己一無是處.	1	2	3	4
17. 我覺得自己有許多好的特質.	1	2	3	4
18. 我可以把事情做得和大多數人一樣好.	1	2	3	4
19. 我覺得自己沒有什麼值得誇耀的.	1	2	3	4
20. 有時候,我覺得自己很沒用.	1	2	3	4
21. 我覺得自己和別人一樣有價值.	1	2	3	4
22. 我希望我能更尊重自己.	1	2	3	4
23. 一般來說,我覺得自己是個失敗者.	1	2	3	4
24. 我對自己採取正向的態度.	1	2	3	4

請圈選一個代表你感受的答案	非常不同意	不同意	沒意見	同意	非常同意
25. 我的身體性感動人.	1	2	3	4	5
26. 我喜歡自己外表.	1	2	3	4	5
27. 大多數人認為我長得不錯.	1	2	3	4	5
28. 我喜歡自己沒穿衣服的樣子.	1	2	3	4	5
29. 我喜歡自己穿合身衣服的樣子.	1	2	3	4	5
30. 我不喜歡自己的身材.	1	2	3	4	5
31. 我的外表不吸引人.	1	2	3	4	5

請圈選一個代表你感受的答案	非常不同意	不同意	沒意見	同意	非常同意
32. 電視和電影中的女生擁有我理想中的外型.	1	2	3	4	5
33. 我相信衣服穿在苗條的女模特兒身上比較好看.	1	2	3	4	5
34. 音樂錄影帶出現苗條女生,讓我希望自己也很苗條.	1	2	3	4	5
35. 我希望自己看起來像雜誌上的模特兒.	1	2	3	4	5
36. 我常拿自己的身材和雜誌,電視上的人做比較.	1	2	3	4	5
37. 在社會上,胖子被認為是沒有魅力的.	1	2	3	4	5
38. 苗條女生的相片會讓我希望自己也很苗條.	1	2	3	4	5
39. 如果想在社會中出頭,有魅力是很重要的.	1	2	3	4	5
40. 如果想在社會中成功,花心思在身材上是很重要的.	1	2	3	4	5
41. 大部分人認為苗條的身材比較好看.	1	2	3	4	5
42. 人們認為愈苗條穿衣服愈好看.	1	2	3	4	5
43. 在現在社會中,讓人覺得你有魅力是很重要的.	1	2	3	4	5
44. 我希望自己看起來像泳裝模特兒.	1	2	3	4	5
45. 我經常看Suger,CoCo等雜誌,而且拿自己的外表和模特兒做比較.	1	2	3	4	5

請圈選一個代表你感受的答案	非常不同意	大部分不同意	不同意	同意	大部分同意	非常同意
46. 在我家,只有非常傑出的表現才能稱得上好.	1	2	3	4	5	6
47. 小時候,我竭盡所能地避免讓父母,老師失望.	1	2	3	4	5	6
48. 我厭惡不夠完美.	1	2	3	4	5	6
49. 我的父母期待我出人頭地.	1	2	3	4	5	6
50. 我覺得事情必須盡善盡美,否則寧可不做.	1	2	3	4	5	6
51. 我給自己訂的目標很高.	1	2	3	4	5	6

12.(a)在過去30天內,你有沒有藉由運動來減肥或避免體重增加?

1 有　　2 沒有

(b)在過去30天內,你有沒有吃的少一點,或吃低卡,低脂的食物來減肥或避免體重增加?

1 有　　2 沒有

(c)在過去30天內,你有沒有節食超過24小時或更多時間來減肥或避免體重增加?

1 有　　2 沒有

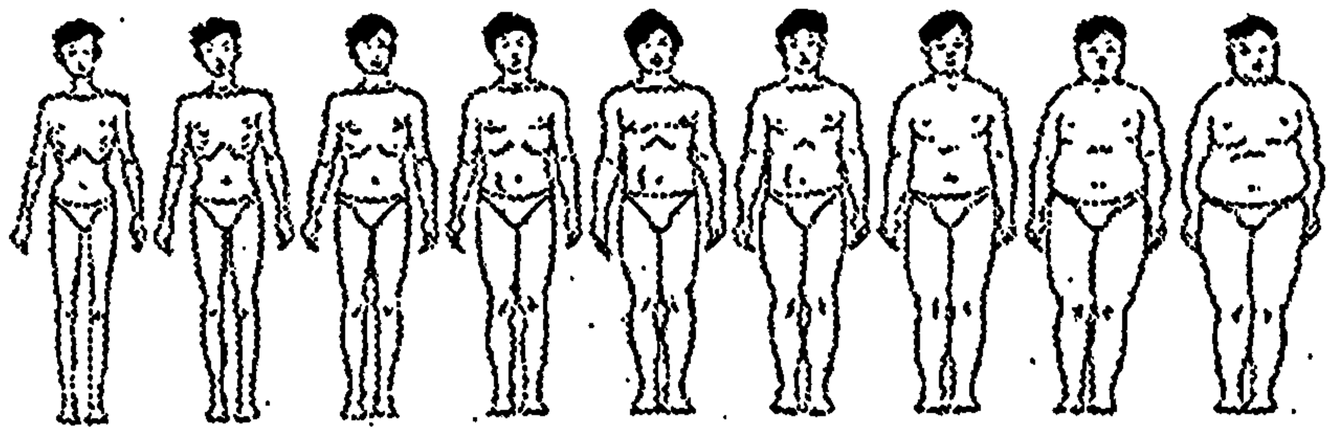
(d)在過去30天內,你有沒有自行服用減肥藥 (沒有經過醫師指示)來減肥或避免體重增加?

1 有　　2 沒有

(e)在過去30天內,你有沒有利用嘔吐或吃瀉藥,來減肥或避免體重增加?

1 有　　2 沒有

請填以下圖形的號碼



1　2　3　4　5　6　7　8　9

13. 你覺得以上哪一個圖形可以代表你目前的體型: _____

14. 你覺得以上哪一個圖形可以符合你希望的體型: _____

請圈選一個代表你感受的答案	非常不同意	不同意	同意	非常同意
15. 整體而言,我對自己感到滿意.	1	2	3	4
16. 有時候,我覺得自己一無是處.	1	2	3	4
17. 我覺得自己有許多好的特質.	1	2	3	4
18. 我可以把事情做得和大多數人一樣好.	1	2	3	4
19. 我覺得自己沒有什麼值得誇耀的.	1	2	3	4
20. 有時候,我覺得自己很沒用.	1	2	3	4
21. 我覺得自己和別人一樣有價值.	1	2	3	4
22. 我希望我能更尊重自己.	1	2	3	4
23. 一般來說,我覺得自己是個失敗者.	1	2	3	4
24. 我對自己採取正向的態度.	1	2	3	4

請圈選一個代表你感受的答案	非常不同意	不同意	沒意見	同意	非常同意
25. 我的身體性感動人.	1	2	3	4	5
26. 我喜歡自己外表.	1	2	3	4	5
27. 大多數人認為我長得不錯.	1	2	3	4	5
28. 我喜歡自己沒穿衣服的樣子.	1	2	3	4	5
29. 我喜歡自己穿合身衣服的樣子.	1	2	3	4	5
30. 我不喜歡自己的身材.	1	2	3	4	5
31. 我的外表不吸引人.	1	2	3	4	5

請圈選一個代表你感受的答案	非常不同意	不同意	沒意見	同意	非常同意
32. 電視和電影中的男生擁有我理想中的外型	1	2	3	4	5
33. 我相信衣服穿在健美的男模特兒身上比較好看	1	2	3	4	5
34. 音樂錄影帶中出現健美男生,讓我希望自己也很健美.	1	2	3	4	5
35. 我希望自己看起來像健美服裝模特兒.	1	2	3	4	5
36. 我常拿自己的身材和雜誌,電視上的人做比較.	1	2	3	4	5
37. 在社會上,胖子被認為是沒有魅力的.	1	2	3	4	5
38. 健美男生的相片會讓我希望自己也很健美.	1	2	3	4	5
39. 如果想在社會中出頭,有魅力是很重要的.	1	2	3	4	5
40. 如果想在社會中成功,花心思在身材上是很重要的.	1	2	3	4	5
41. 大部分人認為健美的身材比較好看.	1	2	3	4	5
42. 人們認為愈健美穿衣服愈好看.	1	2	3	4	5
43. 在現在社會中,讓人覺得你有魅力是很重要的.	1	2	3	4	5
44. 我希望自己看起來像健美先生.	1	2	3	4	5
45. 我經常看體適能,男人等雜誌,而且拿自己的外表和模特兒做比較.	1	2	3	4	5

請圈選一個代表你感受的答案	非常不同意	大部分不同意	不同意	同意	大部分同意	非常同意
46. 在我家,只有非常傑出的表現才能稱得上好.	1	2	3	4	5	6
47. 小時候,我竭盡所能地避免讓父母,老師失望.	1	2	3	4	5	6
48. 我厭惡不夠完美.	1	2	3	4	5	6
49. 我的父母期待我出人頭地.	1	2	3	4	5	6
50. 我覺得事情必須盡善盡美,否則寧可不做.	1	2	3	4	5	6
51. 我給自己訂的目標很高.	1	2	3	4	5	6

最後,想請教你在過去七天中花在身體活動時間,包括工作,做家事,整理庭院/陽台,交通,及你在娛樂,運動等活動中所花的時間,就算你認爲自己不愛動,也請你回答每一個問題.

請回想過去七天所有你做過的激烈活動.這些活動會讓身體感覺比較累,呼吸比平常喘很多,但是一次做至少10分鐘以上的活動才算喔.

過去七天中,你有多少天做激烈的身體活動?

52. 例如跑步,登山爬坡,持續性的快速游泳(不含慢游,玩水,泡水),爬樓梯,有氧舞蹈/運動,快速騎腳踏車,打球(如網球單打,籃球,足球),跳繩,搬運重物(大於17台斤/10公斤),或者是挖土.

_____天

☐ 沒有做激烈的身體活動 ⟶ 請跳答第52題

53. 你一天大概花多少時間從事這些激烈的身體活動?

一天 _____小時_____分鐘

☐ 不知道/不確定

回想過去七天所有你做過的中等費力的活動.中等費力的活動表示:這些活動會讓身體有點費力,呼吸比平常喘些,但是一次做至少10分鐘以上的活動才算喔.

過去七天中,你有多少天做中等費力的活動?

54. 例如:用一般速度游泳,跳舞(不含有氧舞蹈,慢舞,國際標準舞或元極舞),用一般速度騎腳踏車,攜帶有點重的東西(7.5-15台斤/4.5-9公斤:例如二瓶家庭號鮮奶),整理庭院/陽台,費力的家務(清洗窗戶,打掃房屋,擦地板,手洗衣服),或是網球雙打,桌球,棒球.請不要將提輕物的走路算進去.

_____天

☐ 沒有做中等費力的活動 ⟶ 請跳答第54題

55. 你一天大概花多少時間從事這些中等費力的活動?

一天 _____小時_____分鐘

☐ 不知道/不確定

回想過去七天中,你花在走路的時間有多久?
包括上學,居家,和外出交通時的走路,以及你爲了娛樂,運動及休閒而花在走路上的時間.

56. 過去七天中,你有多少時間曾經走路持續10分鐘以上?

_____天

☐ 沒有走路持續10分鐘以上 ⟶ 請跳答第56題

57. 你一天大概花在走路上的時間多久?

一天 _____小時_____分鐘

☐ 不知道/不確定

最後一個問題是: 過去七天,你坐著的時間有多久?
請將上學,居家,做功課及休閒的時間都算進去,包括坐在桌前,打電腦,拜訪朋友,吃飯,閱讀,做著或斜躺著看電視,但請不要將睡著的時間算進去.

58. 過去七天中,你一天坐著的少時間有多久?

一天 _____小時_____分鐘

☐ 不知道/不確定

本問卷到此結束!謝謝!

Appendix 5: Interview guide

Theme 1: My Physical activity

In the first part of the interview, I would like to ask:

1. What do you usually do in physical education (PE) lesson at school?
    1.1 How do you feel about PE lesson? How many times/hours would you like to have for PE lesson each week?
    1.2 Do you play sports with boys during the lesson? or with all girls? How do you feel about it?
2.What do you usually do out of school?

Exercise:

2.1 You just told me that you do exercise; would you tell me how many days you engage in physical activity/exercise per week? How long does it last?
2.2 How does it make you feel when you do exercise and what do you feel afterwards?
2.3 How does it fit in your life?
2.4 How do you think about people who don't exercise?

No exercise:

2.5 How do you feel about your lifestyle now?
2.6 Are there any other activities you want to try? Why? (PA?)
2.7 What do your peers usually do out of school? What do you think about these activities they do?
2.8 How do you think about people who exercise?

Theme 2: My body & Myself

Then, I would like to hear about how you see your own body:

3. Tell me how it feels when you look in the mirror?
    3.1 What do you expect to see in the mirror?
4. How do your features/characteristics make you feel?
    4.1 Are there any features/characteristics are you happy with? Why?
    4.2 Are there any features/characteristics would you like to change? Why?
5. What do you think about your body size/shape/weight now?
    5.1 How do you feel about the changes of your body size/shape/weight?
    5.2 Have you ever tried to modify your body size/shape/weight?

Yes:

5.3 Why do you want to do so? Is there a certain size/weight you want to achieve?
5.4 What methods do/did you use?
5.5 How long did you do this? Was it successful? Why?/Why not?

No:

5.6 Why you have never tried to modify your body size/shape/weight?

5.7 How do you feel about people who try to control their body size/shape/weight?

Theme3: My body & Others

Having previously enquired about how you view your own body, I will be asking you about how you think that others see your body.

6. What kind of girls are the most popular in boys' eyes? girls' eyes?

6.1 How do you feel about it?

7. How would you describe your relationship with others?

8. Have you ever told to other persons about your body figure? Whom? How often?

9. How do you think other people view your body figure?

10. What kind of feedback/comments do you get from others about your body figure?

10.1 Who comment? (Friends, Parents, etc)

10.2 How do you feel about what were said?

(How have other people treated you because of your body figure?)

10.3 Can you think of an example that stands out in your mind?

Theme 4: Ideal body & Society

Finally, I would like to know:

11. What do you think people think about heavy or big people?

11.1 What do you think about heavy or big people?

12. What image do you think the society has for an 'ideal' female body?

12.1 How do you feel about this image? Why you feel that way?

13. Can you describe your 'ideal' female body?

13.1 Where do you get the ideas of 'ideal body' from?

13.2 How attainable do you think this ideal body is?

13.3 How do you know it is easy/difficult to achieve?

13.4 Have you ever tried to drive for this ideal body?

14. Do you watch TV/film or read magazines?

14.1 What types of TV shows/films/magazines do you watch//see/read?

14.2 What do you think about the female images presented by the media?

14.3 Do you feel this has affect on you? Why?

15. Is there anything or anyone else which influences your view of body image?

Is there anything else you would like to tell me about what we talk today? What do you think of when you hear the phrase ' body image'? What effects do you think your body image have on you? What do you think of the interview? How do you feel about it? This is the end of the interview. Thank you very much!

Interview guide

Theme 1: My Physical activity

首先我想請你談談:

1. 平常學校體育課你都做些什麼活動?
   1.1 你覺得如何? 你希望每週體育課有多少次/時間?
   1.2 上體育課時是男女生一起運動還是女生分開運動?
2. 放學後, 你都做些什麼活動?

Exercise:

   2.1 你剛才提到,平常有在做運動, 可否請你說明, 大約每週運動幾次? 每次運動多久?
   2.2 你在運動的時候是什麼感覺? 運動完後又有什麼感覺?
   2.3 在你生活中運動扮演著什麼角色?
   2.4 你對於那些不運動的人有什麼看法?

No exercise:

   2.5 你對於自己現在的生活方式有什麼看法?
   2.6 有沒有其他活動你想嘗試? 爲什麼? (體育活動?)
   2.7 你同學平常放學後都做些什麼活動? 對於他們的活動,你有什麼看法?
   2.8 你對於那些做運動的人有什麼看法?

Theme 2: My body & Myself

接下來,我想聽聽你對自己身材的看法:

3. 請告訴我,當你看著鏡子裡面的自己,你有什麼感覺?
   3.1 你希望鏡子裡面的自己是什麼樣子?
4. 你覺得你的外表或特性如何?
   4.1 自己的哪些外表或特性,你覺得很喜歡?爲什麼?
   4.2 有任何外表或特性,你想要改變嗎?爲什麼?
5. 你對自己的 體型/身材/體重 有什麼看法?
   5.1 你對自己 體型/身材/體重 的改變 有什麼感覺?
   5.2 你是否曾試著改變自己的 體型/身材/體重?

Yes:

   5.3 爲什麼你會嘗試改變自己的 體型/身材/體重呢? 有沒有一個特別的體型/體重想要達到呢?
   5.4 你都用些什麼方法呢?
   5.5 這樣的情形持續多久? 有成功嗎? 爲什麼?

No:

   5.6 爲什麼你從來沒有試過改變自己的 體型/身材/體重?
   5.7 對於那些在控制體重的人 你有什麼看法?

Theme3: My body & Others

先前詢問了你對身材的看法,現在想了解你覺得別人怎麼評價你的身材.

6. 你覺得在異性眼中,哪種女孩最受歡迎?

    6.1 你自己有什麼想法?

7. 你覺得你的人際關係如何?

8. 你是否曾和別人談論過自己的身材? 和誰? 大約多久談論一次?

9. 你覺得別人對你的身材有什麼看法?

10. 別人是如何評論你的身材?

    10.1 是誰說的? (朋友? 父母? ..)

    10.2 對於他們說的哪些話, 你有什麼看法?

        (別人是否因爲你的身材對你不同? 如何不同?)

    10.3 你可以舉個現在想到的例子嗎?

Theme 4: Ideal body & Society

最後我想了解:

11. 你覺得社會上的人如何看待體型較大的人?

    11.1 你自己又如何看待體型較大的人?

12. 你覺得社會上所謂理想女人的身材是如何?

    12.1 對於這樣的形象你覺得如何? 爲什麼你會這樣覺得?

13. 告訴我,你覺得什麼是 '理想'女人的身材?

    13.1 你這個想法是從哪裡來的?

    13.2 你覺得這個理想身材達得到嗎?

    13.3 爲什麼你覺得很 容易/困難 達成呢?

    13.4 你是否曾追求過這樣的理想身材?

14. 你有看電視/電影或閱讀雜誌嗎?

    14.1 你都看什麼樣的電視節目/電影/雜誌?

    14.2 你對在媒體上出現的女人形像有什麼印象?

    14.3 你覺得這對你有影響呢?

15. 請想想是否還有其他人或其他事影響你對身材的看法?

對於今天的話題,還有沒有其他事情 你想告訴我呢?你認爲'身體意象'代表什麼意意呢?對你有什麼影響呢? 你認爲/覺得今天的訪談如何?

訪談到此結束, 非常謝謝你!

Appendix 6: Checklist for achieving a successful interview

Points	Check		
	Good	Ok	Be aware

Part 1: Fostering a climate of trust in interviews:

1.Personal appearance (e.g. when interviewing obese girls, it is good to wear big clothes to make the interviewer looks bigger)

2.Opening the interview
- a) Be friendly, polite and open
- b) Indicate the significance of the study
- c) Explain how the interview will be conducted (e.g., how long it should last and the general areas to be covered)
- d) Give the interviewees the opportunity to ask questions
- e) Ask for permission to audiotape

3.During the interview
- a) Listening, making eye contact, saying encouraging things
- b) Be sensitive to signs of emotional reaction (Are they shy, embarrassed, bored?)
- c) Try to be neutral
- d) Stay on the topic (listen, but put back when off the road)
- e) Repeat answers if not sure; ask the same question with different word
- f) Extend the meanings (Can you explain more? Why? How come?)

4.Closing the interview
- a) Leave people with a feeling of success (e.g., indicate how valuable the interviewees' comments are)
- b) Confirm what will happen next: how and when the results will be made available; whether the interviewees will be offered the chance to check transcripts and when people are likely to be contacted for follow-up work

5. After the interview
- a) Write to thank the interviewee for taking part in the study

Part 2: Evaluating interviewing practice

1. How well is the interview guide working?

2. Is the interview taking too long?

3. Does the interviewee understand the questions?

4. Which questions work? Which questions fail?

5. Do you miss places where you could probe for more detailed information or examples?

6. Do you miss places where you could ask follow-up questions?

7. Do you talk too much instead of listening?

8. Do you build up good relationships with interviewees?

9. Is there anything to indicate that you are gaining peoples' trust and confidence?

10. Are you able to encourage interviewees to talk freely and openly with you?

11. Do you feel you leave interviewees in a relaxed and untroubled condition?

12. Are the data shedding light on the researcher questions you are trying to answer?

(adapted from Arksey, H. & Knight, P.(1999). Interviewing for social scientists, London, SAGE)